THE IRON TRADE REVIEW

VOLUME XXIV. CLEVELAND, O., OCTOBER 8, 1891. NUMBER 41.

THE IRON TRADE REVIEW.

A JOURNAL OF THE
IRON AND STEEL INDUSTRY, THE MACHINERY TRADE AND KINDRED INTERESTS
IS PUBLISHED EVERY THURSDAY BY
THE IRON TRADE REVIEW CO.,
27, 29 *and* 31 *Vincent Street, Cleveland, Ohio.*

TERMS, (strictly in advance):

One year.....$3 00
Six months..... 1 50
Three months..... 75

Advertising Rates Furnished on Application.

ENTERED AT THE POST OFFICE AT CLEVELAND, O., AS SECOND CLASS MATTER.

CLEVELAND, O., OCTOBER 8, 1891.

THE WEEK IN IRON CIRCLES.

General Features. Like advancing and receding armies, the Northern and Southern irons are contesting every foot of the ground in their race for supremacy. This week we have to record the pushing of the line of battle southward, Northern mill irons having recently been sold in the Wheeling district at prices that keep Southern brands out of that market. The wise men of the iron trade say that, if the usual difference in prices existed, all the surplus of Southern mill grades would have been disposed of to rolling mills in Ohio and West Virginia, and an advance would have been sustained, and they are probably right. A glance at the leading Central, Western and Southern markets shows a continued healthy condition and a gradual brightening outlook. At Cincinnati there has been heavy buying to cover consumers' legitimate wants during the next three to six months, but furnaces as a rule have not attempted to force prices much higher. The Louisville market has been quite active during the past week, though no specially large transactions have been reported, and the majority of sales have been in 100 to 1,000 ton lots largely for delivery during the balance of this year. There is a good demand from all lines, and it seems to be pretty generally distributed throughout the country; in many instances the inquiry is sharp for delivery during four to six months of next year. The Chicago market still shows a healthy degree of activity, coke irons being the metals most in demand. For these a number of good-sized contracts have been placed since last report, Southern furnaces getting a good share of business going. On Southern cokes the anomaly is presented of a firm front maintained on the part of a number of the leading companies both as to concession in price and anything in deliveries beyond January 1st., while others holding nominally at same basis of price as their competitors stand ready to cut these figures and grant scattered deliveries whenever good customers want to buy round lots. In general the coke market is firm, with the expectation on the part of the producers of somewhat higher figures between now and January 1st. On the other hand, while many large consumers are buying freely they are doing so in order to cover contracts already booked rather than with the idea of speculating, as it is conceded by conservative minds that production is fully equal to consumption, understanding the fact that the latter is steadily on the increase. In the charcoal market one or two large transactions have been consummated on the part of Lake Superior furnaces, these being closed at figures but little in advance of the old prices which prevailed during June. Several of the leading companies in the Chicago district are, however, obtaining $18.50, Chicago, and finding but little difficulty in placing their unsold metal. The roads in the South and West are being overtaxed for cars and a number of lines are almost blockaded by the heavy traffic now going forward. While there have been no notably large transactions in the Detroit market during the past week, there has been a healthy steady trading in nearly every grade of iron in fair-sized lots and usually for prompt delivery. An unusually large inquiry is seen for Lake Superior charcoal, chiefly from Eastern points. This practically means, however, the usual purchasing done during October and November, whereby lake transportation may be taken advantage of. The carriers have asked some sharp advances in lake rates, which necessitates higher figures at the regular Lake Erie delivery ports. Certain large car wheel makers, too, are investigating the market with a view of getting monthly deliveries during 1892, but with the brighter outlook it will be hard work to close for any considerable amount for delivery further than January to March, except upon a higher plane than present quotations. Altogether, the trade is much more satisfactory, both in price and volume. During the past week more inquiries have been received in the Buffalo market than at any time for several months. Prices have not advanced, but the feeling is much better, with indications that a large buying movement will soon take place. Actual sales, although not heavy, have exceeded expectations. The past week at St. Louis has developed a moderate number of inquiries, whilst a few medium sized orders have been placed at regular figures.

The Local Situation. Ore freights are weaker, this week, on account of the holding back of the grain shippers, which throws the entire wild tonnage upon the ore market, and so creates a temporary overplus of carriers, with its consequence of weakening the rate. Of course, this is but a temporary contingency, as with the first rush of grain the price will go sailing upward. The grain men can far better afford to pay the rate than the ore producers, and it is likely to be nip and tuck between these two interests for the remainder of the season. Nothing new has occurred in the ore situation, except the sale of a small lot of non-Bessemer, left over on the dock from last year, at a price considerably in advance of any yet made this season, and approximating that paid in 1890. The transaction cuts no great figure in itself, but may serve as a straw in reference to the future of the ore market. No one expects to see any sales made this Fall, and yet it is not unlikely that by the end of the year there may be so pressing a demand as to cause a repetition of the sales of two years ago, when ore was sold in the Fall, at a rate too high to be sustained by the pig iron market. The immediate result of that episode was the immoderate advance of pig iron within a very few weeks, followed by a reaction from which the market is still suffering. The conservative men in the ore trade will not be anxious to invite a repetition of this disastrous experiment, and they mean to hold their ore for sale in the Spring, and in touch with the vessel movement. The pig iron business is in the curious position of being on the verge of a boom, without, as yet, giving the first signs of the good times to come. The conditions all favor a sharp advance; the stocks are small, and are still diminishing; trade is good as to volume, a marked improvement in this direction manifesting itself this week, and the consumers are inquiring for round lots where they preferred to buy a car load at a time, a few weeks ago. Yet the price is as low, or nearly as low, as ever it was, since the advance of, say twenty cents a ton in Bessemer, which now sells at $15 at the valley furnances, can hardly be called an advance. But there is some considerable business doing at $15, where none was recorded at the cheaper rate, and, all in all, there is good reason to expect an improvement, were it not for the fact that the future is too easily read to come about in just this way. But one needs to be neither a prophet nor the son of a prophet to make the forecast that December will see better business and better prices in all the various lines, and pig iron will undoubtedly receive its share of the improvement. The six furnaces in the Shenango Valley which, some days ago, banked their fires because of the demand on the part of their men for a ten per cent. advance, have conceded the demand, and have started up again. They were confronted with the choice of giving in, or seeing their furnaces chilled, as they could obtain no labor whatever, and so they chose the lesser evil. Of course, they cannot afford to pay the advance, but in view of the changing condition of the market, they have made the best of it. This action will in the course of a very short time cause the advance to be made throughout the two valleys, which means an increase in the cost of producing a ton of pig iron of just fifteen cents. Manufactured iron is a trifle firmer, and prices are better by a shade.

PIG IRON MAKERS AND PIG IRON CONSUMERS.

If our somewhat sensitive contemporary, *The Tradesman*, of Chattanooga, will kindly read up the files of *The Iron Trade Review* it will, we are sure, quickly withdraw its hasty observation that this journal "has for some time been firing at a dummy in the shape of a figment of its imagination to the effect that 'numerous Southern papers assert that Alabama has surpassed Pennsylvania as a pig iron producer.'" The fact is, the matter has only been referred to once in these columns, and then our comments were based on what we saw in a Virginia paper, and simply served as an introduction to some able and timely remarks by Mr. E. C. Pechin, which, by the way, *The Tradesman* heartily commends. Mr. Pechin's point, that the real test of prosperity of any iron-producing section is the amount of finished product, not the raw material, is a good one and applies not simply to the South, but to the North, and West, and East, as well. Were our Chattanooga editor not so constantly on the alert to be offended by imaginary attacks on the section which it so intelligently represents, it would have smoother sailing on the sea of journalism, and would disarm any criticism as to its own extreme sectionalism.

WHERE IS THE LONGEST IRON SHAVING?

An interesting local controversy has sprung up as to the longest iron shaving turned off. William E. Donnelly, a West Side machinist, started the ball a-rolling by claiming to have made a shaving 107 feet long. Thereupon George Berschig, another machinist, called attention to an iron shaving 111 feet long, and told where it could be seen. This brought out a rejoinder from another machinist, who called attention to the fact that there is an iron shaving on exhibition at Worth's Museum, New York, measuring 175 feet. This has been claimed to be the longest iron shaving in the world but now comes Charles Chaffey, machinist, who states that he saw Tom Curry, an apprentice in the works of the Brush Electric Company, Cleveland, turn an iron shaving 237 feet in length. This shaving has hung on the walls of the Brush Company's works for the past eight years, but was recently broken in making some changes in the factory. This is an attractive subject, and if any machinists throughout the country can present authentic information regarding similar, or longer, iron shavings, we will be pleased to receive communications on the subject.

IRON MAKING IN THE NORTHWEST.

Another evidence of the migratory nature of the iron industry is found in the recent abandonment and dismantling of the Jackson furnaces, at Fayette, Mich., the blowing engines and other heavy machinery having been sold to a Chicago firm. The furnace was a good one in its day, and was run at a profit last year. Failure of the charcoal supply is the immediate cause of closing down the industry.

Hope for the revival of the iron industry in the Northwest, however, lies in the manufacture of coke from the raw coal, and this, we learn, is at last to be tried in connection with the large furnace erected at West Duluth some time since, under the direction of Mr. John Birkinbine, of Philadelphia. The plant has recently been leased to Messrs. Charles Himrod & Co., Crerar & Clinch and Mr. Bertolet, of Chicago, and will be put in blast at the earliest possible moment. The daily capacity of the furnace is over 150 tons or about 1,100 tons of pig iron weekly. It will require a daily consumption of 200 tons of iron ore, 150 tons of coke, and 50 tons of limestone. Its ore will be largely Chandler, mixed with a slight proportion of Gogebic iron, and its limestone will come from an interior quarry in Wisconsin, and not far from Duluth. For this Winter, and until the furnace people can erect their own coke ovens, a large part of the coke for the furnace will be bought of the Lehigh Coal Co., which is producing coke in some quantity only a mile and a-half from the furnace. It is probable that the company will erect its own coke ovens this Winter so that by the time navigation opens, it may be able to supply itself. The success of the new enterprise—for its success seems highly probable—will be awaited with interest.

MONEY AND BUSINESS.

Concluding a careful and conservative review of the financial situation, the *American Banker*, issue of October 3, says:

With an aggregate of National wealth which is rapidly growing and is now estimated at $62 610,000 000 or nearly $1,000 per capita, our floating capital in the loan market is abundant, our banking system has the confidence of the people, our reserves in the Treasury and in the bank are abundant, the flow of gold sets this way, the international exchanges are favorable; and if our money market, now so easy, should be threatened by any causes of stringency for the future, the active agents of the trouble will easily be traced. Among these preventable evils there are only two just now that are much discussed. They are first the artificial creation of stringency by certain well-known methods of manipulation; and secondly, the fear of Congressional legislation on banking and on the finances. Both these perils, it is evident, are somewhat remote, and they are commanding less and less attention, so that for the immediate future the monetary forecast is favorable.

That there "was never such a demand before in Europe for American investments" is a fact as gratifying as it is encouraging.

THE Ishpeming (Mich.) *Press* takes occasion to remark: "The Cleveland *Iron Trade Review* takes an optimistic view of the ore market. As *The Iron Trade Review* has always been a bear in the ore market, it is pretty evident that the situation must have greatly improved of late." Our friend is greatly mistaken. *The Iron Trade Review* is neither a "bull" nor a "bear" on the market. It reports the market as it finds it—that is all. If its reports do not bear out the sanguine predictions of those who wager their money on a big iron ore production, or descend to the depths of woe in which some dyspeptic prognosticators seem to revel, it can't be helped—facts are facts, whomsoever they may appear to help or hurt.

A NICKEL steel ingot weighing seventy-five tons was cast in the open-hearth department of the Carnegie, Phipps & Co.'s Homestead mill last week. This is the largest nickel steel ingot ever cast in this country, and it was without a flaw.

COLUMBIAN Exposition stock subscriptions have now been paid in to an aggregate exceeding $3,000,000, although only 60 per cent. has thus far been called for. The $5,000,000 of city bonds voted by Chicago are now available and will be put on the market soon.

THE Pittsburgh *Dispatch* produces figures to show that the Welsh tinplate manufacturers have been making from 33 to 45 per cent. per annum. Good reason enough why Americans should make their own.

FUEL oil has taken the place of gas in the nine-inch mill of the Illinois Steel Company at Bayview, Wis.

POINTS ON THE STEEL RAIL SITUATION.

A STATEMENT.

Is the ice to be broken in the steel rail market at last? An order for 10,000 tons was placed last week with an Eastern mill, and other large orders are in the air. Prices, however, continue very low—$30.75@$31 at tidewater.—[Iron Trade Review.

A COMMENT.

Not so very low; the price has been a round $5 below the figures quoted. There should be large profit at the combination rate, with wages and materials as now sold.—[National Labor Tribune.

A STATEMENT AND A COMMENT.

What does it profit a man if prices are $10 higher providing there is no market? According to the report of the Board of Control, the sales of standard rails up to September 1, for this year's delivery, figured up 896.798 gross tons, so that during the whole of August the sales aggregated only 36,000 tons, while they were 52,000 tons in July. The shipments, which had been 454.423 tons up to July 1, reached 584.938 tons a month later and 699 027 tons on September 1. In the two months, in which the new orders figured up 88,000 tons, the shipments were 245 000, leaving only about 200,000 tons of orders to be rolled in the last four months of this year, not counting any new work which might be secured during that time. To keep up the rate (says the *Iron Age*) of running during July and August, when the Western mills were driving fast and the Eastern mills were running slowly, it would be necessary to secure orders aggregating 300,000 tons for 1891 delivery. The *Iron Age* doesn't believe that any such quantity will come into the market. The fact seems to be that the railroads are in no shape at present to make extensive purchases, and the looked-for revival in these lines may be postponed until after the first of the year.—[Iron Trade Review.

A COMMENT ON A COMMENT.

We do not regard the *Iron Age* as the gospel of the trade. The fact that it is published in New York city and has many pages to each issue accounts for its "putting on airs," but it does not follow that because a paper puts thus on it is in possession of a monopoly of "know all." The fact that the orders have been as stated is favorable to big demand in the future. The railroads have been doing an immense tonnage and the howl now is that their cars are in so constant demand that patrons must pay for every hour of delay in loading and unloading. The coal and iron trade can't get enough cars because of the farmers' demand, and the farmers are worried because they can't get prompt transportation for grain. Does anybody imagine that with this condition and the fact that the roads have not been keeping up repairs, there can be otherwise than a notable increase of demand for track and car iron the next year? If the railroad companies shall not be by the close of this Autumn's

business in shape to make extensive purchases, they never will be.—[National Labor Tribune.

FINALLY.

Our able contemporary leaves out of the account one very essential element: The recent financial strain has no doubt affected the railroads very seriously. They can't make improvements if they would. It is a condition, not a theory, that confronts them. Let us hope, however, that with the present large tonnage movement, they may be in better shape after the turn of the year.

MULTIPLIED USES OF COMPRESSED AIR.

A New York dispatch of September 30 says: If Engineer Robert Gilham, of Aldrich Court, be correct in his observations compressed air will shortly be in the field in opposition to electricity as one of the revolutionary forces of this century. He has just returned from an extended sojourn in Paris, where he made a thorough study of the compressed air system of that metropolis.

Of the multiplied uses to which the ingenious and inventive Frenchmen have applied compressed air, and of the development they have made in means of creating and distributing it, Mr. Gillham speaks as an enthusiast.

"I was simply amazed," said he in talking of his work, "at the progress made in the application of the comparatively new science. Why, in a refrigerator about fifteen feet square I found the bodies of a man and woman who had lain there thirteen months, and in both the flesh of the body and face were in as good condition as immediately after death. I was informed that the bodies were being kept for the medical university."

One fact of importance noted by Mr. Gillham on his visit was the preparation Paris engineers are making by means of compressed air with a view to averting the terrors of another seige such as was experienced in 1871. Refrigerator stations can in an emergency be made to contain enough food to last Paris for over a year.

"Before accepting the invitation of Mr. Victor Popp to visit the great central station," said the engineer, "my time was occupied by personal visits to numerous consumers, with the view of discovering the various uses of compressed air in Paris, its advantages and disadvantages, and especially to learn how the consumers felt regarding its use after having much experience with it.

"At a very large cafe on Avenue de l'Opera I saw some interesting applications. A twenty-five horse power engine, which was formerly operated by steam, is now to run by compressed air. The pressure in the street main at this point registered six atmospheres. Near the engine in the pipe is arranged a pressure-reducing valve, which can be adjusted to any pressure. In this case the air was reduced from six atmospheres to four atmospheres. From the reduction valve the air is conducted to a small coke radiating device made from cast-iron, eighteen inches in diameter.

"The heater is a hollow cylinder, having vertical divisions, the central hollow space being 12 inches in diameter, with a small cover on top. Around and outside this space, in which the coke is burnt, is arranged a series of vertical spaces between the fire space and the outside shell.

"The air is introduced into this space at normal temperature of air in the street mains, is carried upward through the first vertical division or chamber to the top of the heater, where it passes into a second chamber or division, then downward through this to the bottom of the heater, where it passes into the third chamber or division, and thus the process of leading the air up and down through the various vertical divisions of the heater, numbering ten divisions in this case, is continued until the air has secured a greatly increased temperature, due to contact with the interior heated surface of the divisions or chambers of the heater, the degree of temperature depending upon the character of the fire maintained in the heater.

"The air is then conducted to the engine, where it operates exactly as steam. The engine is connected with a dynamo, which generates all the electricity used in lighting the premises of one or two neighbors. Electric accumulators are arranged in an adjoining room next to the engine room of capacity sufficient to furnish light for two days. In case any failure occurs in the engine, dynamo or air light can be provided.

"The exhaust air is taken from the engine and conducted to a refrigerator of considerable size, in which are arranged meats of all kinds, game and vegetables. The temperature in the refrigerator is never above 40°. It is, however, arranged in two compartments. In one the temperature is maintained at or near the freezing point and the other above it.

"I was informed that by increasing the air pressure and using the same pressure in the engine as that maintained in the street main—six atmospheres—he had with the exhaust air manufactured 250 pounds of ice per day. Table bottles filled with water were arranged in order in the refrigerator and the water frozen solid, and when ice water is needed in the cafe they are placed on the table. Here is a list of the various applications of compressed air in the city of Paris:

Force—401 motors, representing 1,837 horse-power and 1,108 kilogrameters.

Refrigerators and cold rooms—185 horse-power.

Electricity—17,589 incandescent lamps and 960 arc lamps.

Clock service—About 10,000 clocks.

Canalized public roads for distribution of compressed air, July 1, 1890: Total length of pipes, 125 miles. Up to April 1, 1891, there is a total length of pipe distributing compressed air for power purposes of 60 miles, and for clock service 65 miles.

Motive power—Medical applications, air baths, medical electricity, electric light dental apparatus, elevators, grinders, pipes, raising of liquids, manipulation of wines and drawing of beer, wringing machines, sewing machines, embroidery machines, machines for hashing meats, etc., ice machines, saws, grindstones, printing and press machines, circular saws for ivory, cabinet making, joining, cardboard, manufacturing, packing, moulding, marble, etc. Lathes—Saw, polishing lathe, repulsing lathe, crystal lathe, cork lathe, meerschaum manufacturing and billiard balls, etc.

Other applications—Dynamo, feather-dyeing machine, tapping machines, cardboards, sharpening machines, clipping machines, furnace blowing pump, paper wafers, stitching machine, graveling machines, coffee burning machines, lace-making machines, steam pumps, gilding machines, nickeling machines, umbrellas, chains, boring machines, cleansing machines, weaving machines, pill press, seltzer-water machines, advertisements, coffee grinders, coppersmith's works, transmission of telegrams, combs, cylinder manufacturing, stamping, turbine, carding, etc.

Refrigeration, ventilation and cold rooms—Preservation of the dead, ærotherapy, meat refrigeration, etc.

Electricity—Municipal service, electric lights, heaters, concert halls, newspapers, etc.

"Compressed air is unquestionably a perfect agent for the transmission of time indications and records, because of this application the pulsation of a central located clock can be transmitted to an indefinite number of clocks in different parts of the city with rapidity and accuracy, which pulsations actuate the local clocks by means of most simple devices. There are two central pendulum clocks, one in use; the other is used only in case of accident, and the operating clock. These are operated by means of self-winding gears and weights; thus there is no possibility of forgetting to tend the central clock.

"Twice every minute—at 20 seconds and at 60 seconds—the clock automatically opens the valve communicating with the receiver described, permitting the discharge of the contained air in the receiver to one and one-half pounds. In less than 20 seconds the air thus liberated has reached 10,000 clocks and forced upward a small valve at each clock, by which the hands of the clocks are made to move forward one minute; the valve that liberated the air is then automatically closed and the reducing valve opened, and the receiver again charged with air, ready for the next discharges until the operation is continued.

"The location of the clock, though it may be at the most remote part of the system, makes no difference, the hand is advanced with those on other clocks. In order to actuate the 10,000 clocks on the system, three cubic meters of 35.3 cubic feet of compressed air, at ten pounds pressure per square inch, is used per minute. It can be noted that about 5,000 clocks could be operated as well by the same expenditure of air. After the clocks have thus been actuated by the air it is allowed to escape from the pipes, which usually requires 38 seconds.

"I next visited the large compressing station, wherein can be found the history of this wonderful and most complete air-compressing system in the various designs of machinery, showing a progressive improvement and a development in the efficiency of the system as experience was gained and the field of application broadened.

"This great system found its origin in a small pneumatic clock system established by Mr. Popp in 1880 in Rue St. Anne, quite near the commercial center of Paris. The success of the undertaking and the consequent growth of the system compelled the establishment of a new and larger central compressing station, which was erected in the Rue St. Fargeau, nearly five miles from the Chamber of Deputies, in the eastern portion of the city, called Belleville.

"We first entered the old compressing room, where two single horizontal and one beam compressing engine were pointed out, which, up to a little less than three years ago, furnished all the air required in the service. Now, there are ten large cross compound condensing engines operating 20 compressors, representing 5,000 horse-power, which by next February will be increased with the new plant to 17,000 horse-power.

"After compression the air is forced at a pressure varying from 5½ to 6 atmospheres into a series of large wrought iron receivers or accummulators arranged longitudinally along the building in front of the compressors. As the front or street end of the building is approached receivers are placed higher, affording opportunity for the freeing of the water from the air before taking it into the street mains.

"We made an examination of the Mekarski compressed air motor system, which is being successfully operated and has been in actual use for several years at Nantes, France.

"The guage of the track in Paris is 4 feet 9 inches; the rails are the grooved pattern. The length of the track (single), including branch line, is about four miles, with a very great number of curves and excessive grades—about 8 feet in 100. The motors are similar to an ordinary street car, having a deck roof, upon which seats are arranged for passengers as well as seats inside the motor car, no seating capacity being occupied by motor appliances.

"The engines operating the motor are of slide valve design, protected from dust by means of an apron and a dust pipe compartment below the seats of the car. By raising the apron by the side of the car the engines are exposed and can be examined if desired. Under the floor of the car attached to the frames are suspended a series of nine air receivers, the air being used from the first three to make the down trip, and from the second three for the return trip, the other three being charged with air, which can be used should emergency require.

"These receivers are connected with a small but round reheating device 20 inches in diameter arranged in the forward platform of the motor, in which is arranged a reduction valve and pressing gauge controlling the pressure of air used in the engine. Each set of receivers has independent throttling valves. The total weight of the motor is 10 tons, without passengers, and it can seat 50 of the latter."

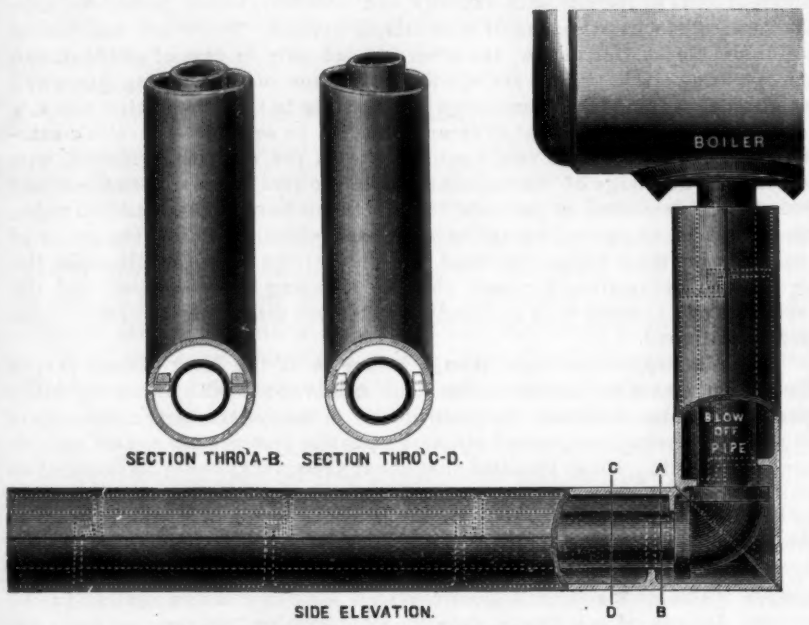
Mr. Gilham gives it as his opinion, after an extended study, that compressed air is already a formidable competitor of the cable and electricity as a means of surface transit.

BLOW-OFF PIPES.

Among the defects reported by our inspectors many defective blow-off pipes occur, and accidents often arise from this source. The defects are usually due to the burning of the pipes. When sediment is present in the feed water, the pipe becomes partially filled with it, and overheating is the result; and even when the water is pure, the high temperature to which the blow-off pipe is exposed seems to cause the water to attack the iron, and deterioration may be quite rapid.

Much of this trouble seems to be due to the flame striking directly against the pipe, and to overcome it, it is customary to slip a cast iron sleeve over the pipe to protect it. A piece of soil pipe is the usual thing for this purpose. This in turn becomes burned away, and to replace it, it is necessary to disconnect the blow-pipe and run it through the new sleeve. To avoid this trouble, half sleeves with lugs or flanges, fastened together by bolts, have been used, but these have not proved perfectly satisfactory, as the projecting lugs are apt to burn away after a little while.

Steam users have often asked our inspectors for something not expensive, which could be put on without disconnecting the blow-off pipe, and some years ago we made drawings for a sleeve having supporting rings with lugs



CAST-IRON COVERING FOR BLOW-OFF PIPES.

so arranged that the two halves could be securely fastened together without bolts or nuts. The details of the sleeve will be seen from the cuts. Inside of the sleeve half rings are cast, the internal radius of which is slightly larger than the blow-off pipe. At the ends of these half rings hook-like lugs are cast, which serve to fasten the parts of the sleeve together. In putting this covering on, one-half of it is first laid against the pipe, and the other part is brought down upon it with one end hanging half or three-quarters of an inch over the end of the first half. The two are then slid together until the hooks or lugs inside lock together. The dimensions of the sleeve may be altered at will, but we have recommended the following for a two-inch blow-pipe: Diameter of cast iron sleeve internally, 3⅞ inches; thickness of casting, ¼ inch; distance from one supporting ring to the next, 8 inches. The ends of the horizontal and vertical lengths are, of course, beveled so as to fit together, and care must be taken that the lugs or hooks that secure the parts together do not come within, say, an eighth of an inch of the blow-off pipe or the sleeve itself, as otherwise the parts will be likely to become iron-bound under the intense heat to which they are exposed. If the brick-work is so arranged that a small amount of air can enter the sleeve, a circulation can be maintained through it that will give further protection to both sleeve and blow-off. The rings in the sleeve will prevent the air from drawing freely through, but it will be found that enough will pass by them to be of benefit.

We believe this arrangement has proved satisfactory, and any one wishing to use it can make a pattern, one pattern being sufficient if it is made long enough, since shorter pieces may be cast by simply cutting off in the sand mould to the length desired.—[The Locomotive.

IRON AND STEEL BOTTOMS.

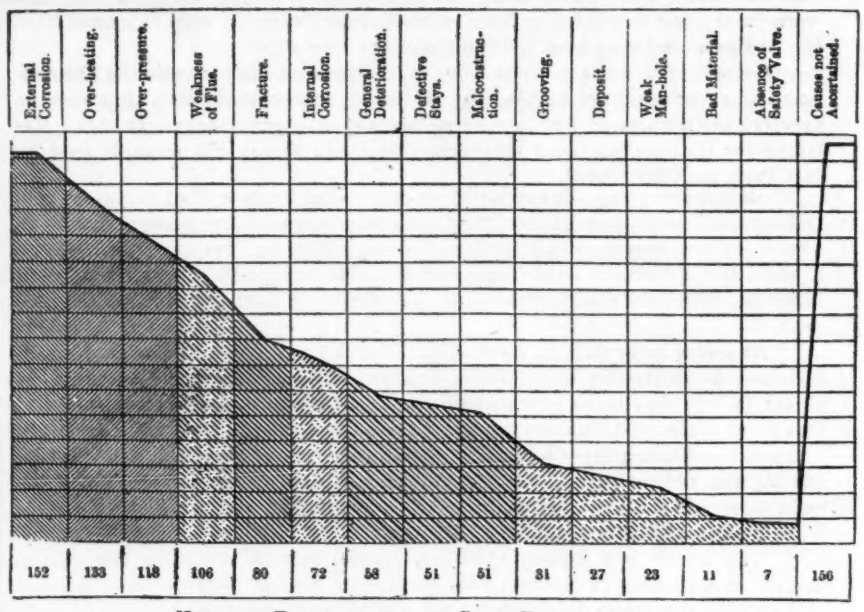
The fact that trying to keep paint on the bottoms of lake vessels has long been considered a detriment, if not a useless expenditure of time, money and material, is all very well for wooden vessels, and history cannot prove that the wood is rendered less durable in any way through the absence of a coating of any pigment. It is not so, however with the outside shell plates of an iron or steel built vessel. Hitherto, no more attention has been paid to the bottom plates of a steel vessel than there has been in the past to that of the wooden boat, and now it would be interesting to know what percentage of corrosion has taken place in the bottom plates of our oldest metal boats. The fact should be thoroughly appreciated by the owners and managers of our modern built valuable steam tonnage, that iron or steel will positively corrode when immersed in fresh, as well as in salt water, and that the plates exposed for a few days to the action of the air and then again submerged for say forty-eight hours are liable to deteriorate in a greater ratio than that is generally believed at the present time. Any measure or percentage of exfoliation must vitiate the original metal, and if rust is permitted to remain the act of corrosion and consequent disintegration is still further engendered.

It matters not how well an iron or steel vessel may be built, or what care the builders may exercise in coating the interior during construction (and this is made a special feature of in one or two of the lake shipyards) if, during the vessel's career, she is allowed to grossly deteriorate through inattention to her bottom shell plates, and taking into consideration the long period of inactive submersion during the Winter months it would seem only reasonable to scale, coat and protect the surface of the outside metal as well as that of the inside. Granting that a decade might elapse before any material weakness would be made apparent, we still think that our modern tonnage is worth more than a ten years' purchase, and that their earning capacity after that period is liable to be of more value to their owners, if held during the whole period, than it was during the time money was being earned to repay the principal and interest of their cost.

We take a pardonable pride in asserting that nowhere are vessels so well kept up as they are on the lakes, everything that a vessel requires, or the demands of her special trade, is cheerfully and promptly furnished, hence deterioration, unsight and unseen, ought not to be allowed to set in through, perhaps, a mistaken idea of non-requirements, until an unusual casualty revealed the fact that an enormous outlay was found necessary to replace an important material decay which ought to have been recognized during the various stages of corrosion.—[Marine Record.

THE CAUSES OF BOILER EXPLOSION.

The accompanying diagram shows graphically the causes of 1,079 boiler explosions, and is based upon an analysis of available reports of boiler explosions over a series of years. It was prepared by Mr. B. H. Thwaite for his



NUMBER OF EXPLOSIONS FROM THE CAUSES ENUMERATED ABOVE

lecture on steam generators, delivered in England a short time ago, before the Yorkshire College Textile Society, and we produce it from *Industries*.—[The Locomotive.

Soldering Iron with Nickel.

Herr Fleitmann's experiments in soldering iron with nickel have yielded some important results with regard to the volatility and atomic penetration of the former metal, says *Iron*. The adhesion of the two metals was so intense that it became impossible to separate them by mechanical action, and chemical analysis proved a perfect assimilation, although the soldering had been effected at a temperature of from 500° to 600° below the fusing point. Other tests established the volatility of iron when heated to cherry redness. Two plates of iron and nickel, superposed, were submitted to the same degree of heat; the iron passed into the nickel to a notable extent without soldering or adhesion of the surfaces resulting. On the whole surface of the sheet of nickel an alloy with the iron was formed, which, in the case of one millimetre sheets, penetrated to .05 of their thickness, and contained on the average 24 per cent. of that metal, the proportion being naturally stronger on the surface. An important fact is that the passage of the iron to the nickel is not reciprocal. While the combination disclosed itself on the surface of the nickel plate by the argentiferous lustre of an alloy of iron with .50 per cent. of nickel, the iron plate remained intact, and preserved the sombre appearance which it had received from the scaling.

The First Iron Bridge.

Accustomed as we of to-day are to look upon iron as one of the most common as well as essential elements in the construction of almost everything, from the tiniest needle to the ponderous railroad bridge or magnificent building, there was a time when its use for structural purposes was looked upon with suspicion and distrust. There is standing to-day in England the first bridge ever built of this material, and it is in constant use notwithstanding the fact that it has stood the strain of travel for over 100 years. This old bridge spans a little river between Worcester and Shrewsbury, and was built in 1778. It is about 96 feet long and weighs 378 tons. Stephenson, the great engineer of his time, says of this bridge: "When we bear in mind that the manipulation of cast iron was at the time of its erection in its infancy, we cannot help but feel convinced that unblushing audacity alone could conceive of such an enterprise, and the intelligence with which the details are outlined and executed is equal to the boldness of the conception."—[Manufacturers' Gazette.

LAKE SUPERIOR MINING NOTES.

The Dunn mine is making every minute count now and is doing great work in the way of getting ore to market. The supply of cars holds good and the daily output ranges from 900 to 1,500 tons. The shipment for this season up to Wednesday was in round numbers 126,000 tons, leaving nearly a month in which to move 30,000 tons, which will even the output of last year. The work in the north end of the mine is proving well, and it is thought will form an important part in the future work of the now great iron property. At the south end the mine track is being moved more to the east, it proving to be too close to the new open pit to be considered safe. There yet remains 10,000 tons of ore in stock, though it is continually decreasing. The Dunn now employs a working force of 150 men.—[Iron Range, Iron Mountain.

For some time past it has been known that the Lake Superior Iron Co. possessed a valuable deposit of hematite iron ore on lands adjoining those of the Winthrop Iron Co., a short distance from the city of Ishpeming. In the west end workings of the Winthrop the ore dipped to the north and upon Lake Superior ground. Indeed, the Winthrop had mined several thousand tons from the property of its neighbor, so that the presence of ore was pretty well determined. The Winthrop Iron Co. possesses the surface right of the land in question, the Lake Superior Iron Co. owns the mineral right, and has the privilege to go thereon and mine ore. This the company is now preparing to do, awaiting the return of Mr. Thompson, their engineer, who is in Chicago, so that the necessary surveys can be made.—[Iron Ore, Ishpeming.

At No. 6 shaft of the Lake Superior mine they are changing the direction of the first 275 feet from an incline to a vertical, the object being to use a cage here. From the 275-foot level down the shaft is vertical.—]Iron Ore, Ishpeming.

The Stowell Mining Co. have resumed operations at their property on section 16, 59-14 on the Mesaba range. Capt. John Mallman is in charge, and at present test-pitting is being done. The Stowell people had an encouraging showing when work was necessarily discontinued early last Summer, and no doubt will soon have something to show.—[Iron Journal, Tower, Minn.

A most important development has been made at the Pioneer mine within the past week. Shortly after Capt. E. J. Gilbert took charge of the mine, he commenced a shaft a short distance northeast of No. 3 shaft. After passing through 13 feet of sand, a solid and well-defined ledge of ore was struck, into which they have now sunk 20 feet. This confirms the belief of several mining men that the previous shafts were sunk too far south, and although they were in ore it was not equal, nor the vein as satisfactory as that on the great Chandler, adjoining on the west. The *Journal* predicts more rapid developments at the Pioneer than in the past.—[Iron Journal, Tower, Minn.

The Florence recommenced shipping ore yesterday, and it is thought that daily shipments will be made from now on until the close of navigation. The Florence has nearly 80,000 tons in stock and will have no difficulty in sending forward 50,000 tons, thus making its total shipments about 80,000 tons for the season.—[Florence Mining News.

A fine outcropping of merchantable ore has been discovered on the northeast quarter of the northeast quarter of section 4, 42-32, in the Crystal Falls district. The lands are owned by the Sawyer-Goodman Co., and are held under option by Capt. Thos. McCusker, the well-known mining man. He has traced the outcropping for a distance of 300 feet, and will begin thorough exploratory operations shortly.—[Florence Mining News.

The Lincoln mine will have ore to sell next year, it having passed from an exploration to a producing mine, as shown by the recent developments. In the north crosscut clean ore 15 feet wide was shown.—[Diamond Crystal Falls.

There is a probability that the Lottie or Harding property will change hands before long. It seems that all that prevents the deal from going straight ahead is a difference of opinion as to whom the option rightfully belongs.—[Diamond Drill, Crystal Falls.

The Dunn mine is making every minute count now and is doing great work in the way of getting ore to market. The supply of cars holds good and the daily output ranges from 900 to 1,500 tons.—[Diamond Drill, Crystal Falls.

Ore was encountered at the Monongahela exploration Thursday, though to what extent it will continue is a conjecture, but the surrounding formation is very favorable.—[Diamond Drill, Crystal Falls.

The diamond drill of the Buffalo Mining Co. is boring towards the deposit recently found upon the Blue, and has something over a hundred feet yet to cut before the ore of that lens is expected. Should it be found it will prove a good thing for the company.—[Iron Ore, Ishpeming.

A Shell of Tinned Steel Inserted in an Iron Kettle.

An English inventor has patented a process for lining hollowware in a superior manner without increasing the cost of manufacture. This invention consists in substituting a steel-tinned lining, either spun or cast, in the iron pan, instead of the ordinary process of tinning or enameling. It is claimed for the new method that it effectually prevents the appearance of any sand or pin-holes or roughness, so that the interior of the sauce-pan will present a smoother and brighter appearance than can be secured under previous methods of manufacture. The costly process of burning and annealing can be dispensed with in operating this process. It is intended to apply the process to lining articles with brass or copper instead of tinned steel, thereby producing what is to all practical purposes a copper or brass pan at the same price as an ordinary tinned one.

The English Iron Market.

Concerning the English iron market our correspondents, S. W. Royse & Co., write under date of September 24: The special feature of the metal markets during the current month has been their steadiness. Values of pig iron have only fluctuated a little, but there has been a general tendency to a higher level, and a total advance of about 9d. to 1s. per ton has been made since the beginning of the month. A steady business has been done, shipments from Middlesbrough are very satisfactory, showing a considerable improvement upon those of last month, and though prices are momentarily a shade easier, a distinctly hopeful feeling prevails as to the future.

Results of Reciprocity.

The reciprocity treaty existing between Brazil and the United States has now been in operation long enough to afford a practical exemplification of the value of the arrangement with that Republic. The export trade of the United States and Brazil has shown a healthy growth since the treaty went into effect. During the month of June the exports of articles affected by the reciprocity agreement were $999,959 against $505,999 for the same month of 1890, or an increase of 98 per cent. The increase was divided about equally between agricultural products and the manufactures of iron, steel, cotton and a few other articles. Exports of breadstuff increased from $300,000 in June, 1890, to $419,000 in June, 1891. At this ratio the twelve months, beginning with April 1, of the present year, should show a total in the export trade of Brazil of over $5,000,000. Exports into Brazil amount to about $120,000,000 annually, and that of the United States to about $11,000,000, which makes it apparent that there is a large field for the merchants of this country, whose exports are favored by differential duties. Among these are the hardware and the agricultural machinery and implement dealers. The farmer, perhaps, will get the largest share of the returns.—[Stoves and Hardware.

Stoppage of Railroad Building.

Though the fact has been but slightly commented upon, yet it is true, nevertheless, that railway building in the United States has fallen off in such a marked degree that there must be some radical reason for it. The only explanation thus far afforded is, that private capital has been rendered timorous by the Interstate Commission and State Commissions, which have not deemed it their duty, as investors see it, to uphold and invigorate the railway systems of the country. While it is admitted that there must be laws governing the action of railroads, business men are beginning to insist that the people and not a few individuals do the governing. Be that as it may, there is no doubt that railroad building in the United States has virtually come to a halt. Whether this will prove damaging or not remains to be seen, but it must be admitted that there is something remarkable in this sudden stoppage of railroad work, in view of the fact that so much new territory has been opened up during the past few years. This subject will likely become interesting food for discussion in business circles ere long.—[Stoves and Hardware.

The "Soo's" Wonderful Record.

The canal at the "Soo" has again broken the record by passing 1,270 craft, registered and unregistered. About 72 per cent. of these were steamers. The registered net tonnage was 1,460,144. This, notwithstanding the very late start of lake navigation this year, brings the traffic at the end of August up to 92 per cent. of that of last year at the same time, and it is expected that in spite of the meagre shipments of iron ore the traffic for this year will equal that of last. The Suez canal has had a remarkable accession to its commerce during the first half of this year; for the six months ending with June 30th last, 2,212 steamers of 3,971,492 net tons register passed, compared with 3,389 vessels and 6,890,014 registered tons for the whole of 1890. If the traffic of the Suez canal continues at the present rate throughout the year it will be very nearly as large as the traffic through the Soo canal. It is interesting to note, in relation to the objections made to canal with locks, that 828 lockages were made at the lock on the Soo canal during the month of August; this was rather more than one per hour for that period.—[Railroad Gazette.

The Hardware Trade

The hardware trade, speaking for the whole country, is in a very satisfactory condition, with such prospects as to make expressions of confidence general. The opening month of Fall has not been up to expectations, however, and the sanguine are disappointed. Upon the first certainty of good crops and the high prices then prevailing, it was anticipated that a boom would follow harvest; but trade remained steady and prices have not advanced, hence some are dissatisfied with the really healthy conditions, which have given a larger volume of business up to this time than that of last year. The demand for heavy hardware has been continually on the increase, and substantially the same may be said for shelf and builders' goods; in fine, there is every prospect that the trade as a whole will round up at the end of the year largely in excess of that of last year.—[Farm Implement News.

Electrically Welding Railway Bars.

The electric welding plant of the Johnson Co., at Moxam, Pa., near Johntown, has proved a success in welding railway bars, switches and crossings. New machines have been added, and now one is being placed to weld sections to eight inches in diameter. Whatever doubt has existed respecting the practicability of this process must give away before this fact. The Johnson Co. is a very practicable kind of corporation, makers of street railway plants mainly, and is composed of skilled men, long in the business. One thing that permits a successful application of electric welding in their works is the large number of uniform welds that can be made at one time.—[Industry.

A NEW coke furnace has been invented by a Belgian engineer, Mons. Martial Fromont. It is a reverberating furnace, capable of making coke from a coal very much inferior to that generally used.

A HYDROCARBON BLOW-PIPE AND FURNACES.*

BY WM. HOSKINS.

Chemists and assayers familiar with solid fuel furnaces are aware of the many inconveniences and annoyances attending their use. A gas furnace, if a good one, is entirely satisfactory where gas is available; but in small towns, mining camps, and other places where it cannot be obtained, the want of a portable, clean, and economical apparatus has long been felt. I am aware of no effective liquid fuel furnace now in the market. Any furnace requiring a bellows to produce a blast is certainly very inconvenient. The furnace illustrated, I think, meets the requirements as nearly as is possible, being portable, automatic, cleanly and economical. The fuel required is gasoline of 74°.

Fig. 1.—T is a tank made of brass and holding about one gallon of the liquid fuel (gasoline). P an ordinary force pump with automatic valve and cut off at A and C, V a little thumb screw for letting out the air when through an operation. F is the filling screw. The burner D is of course the principal part of the apparatus. The two sides and end are hollow, permitting the fluid to circulate around the burner; when about to use the apparatus this is heated by burning a little alcohol or gasoline in a dish under it.

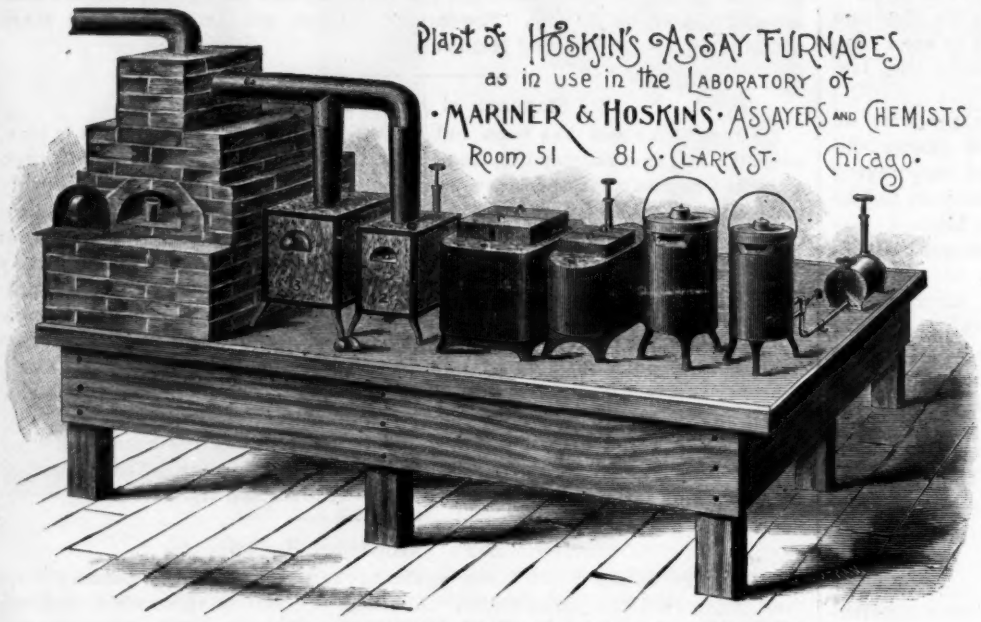
The valve C is now opened and a few strokes of the pump given and the valve closed, thus creating a pressure in the tank on top of the gasoline, which is forced through the pipe H to the burner, through the lower tube, across the head and back again through the upper tube and out at the fine orifice at the end of E, but the liquid as it passes through the hot burner becomes vaporized and issuing from it as a highly heated gas, mixes with the air and burns as is seen in the large engraving, Fig. 4; if the pressure in the tank be now increased, the fluid flows faster and the vapor issues with great force from the burner, drawing in the surrounding air and burning as a very hot blast. The heat produced by the combustion which takes place in the central tube of the burner is sufficient to continue the vaporization in the small tubes and so the operation becomes automatic after once starting; it is only necessary to use the pump occasionally (once every half hour or so) to keep up the pressure in the tank which is lessened only by the consumption of the fuel, no air passing out from the tank into the tube H. The fire may be controlled by regulating with the valve E, or by varying the pressure, which in ordinary work should be about 20 lbs. per square inch.

The blast may be used in various ways besides heating crucibles, etc. Fig. 2 is a crucible furnace, and Fig. 3 is a muffle furnace especially designed for this apparatus. The blast enters at the back; complete combustion takes place in a long slightly tapering combustion chamber from which the hot products of combustion are conveyed around the muffle, issuing from a narrow opening at the top of the furnace. As to the capacity, one-half pound of cast iron can be melted in 15 to 20 minutes, and the muffle furnace can be made sufficiently hot for assaying in about ten minutes.

The blow-pipe apparatus weighs about ten pounds, crucible furnace is 4 inches in diameter, and 5 inches deep, and is constructed of fire clay. The muffle furnace is also fire clay and will receive a muffle 10 inches long, 6 inches wide by 4 inches high.

It might be well to add that the cost of operating in our larger cities where gasoline can always be obtained is about 3 cents per hour.

*Reprinted from the Journal of Analytical Chemistry. Mariner and Hoskins, assayers and chemists, Room 51, No. 816 Clark Street, Chicago.


Plant of HOSKIN'S ASSAY FURNACES
as in use in the LABORATORY of
MARINER & HOSKINS · ASSAYERS AND CHEMISTS
Room 51 81 S. CLARK ST. Chicago.

A HYDROCARBON BLOW-PIPE AND FURNACES.

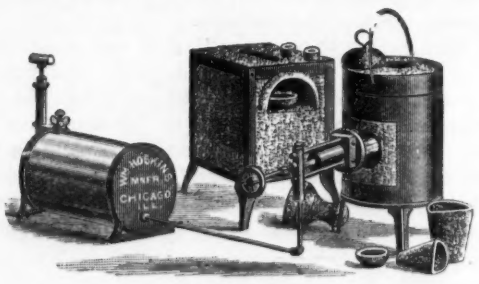


FIG. 4.

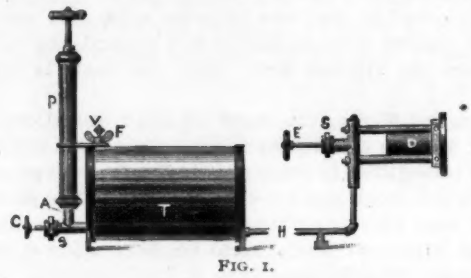


FIG. 1.

FIG. 2.

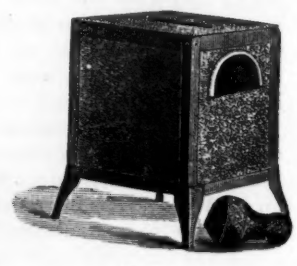


FIG. 3.

A TRIBUTE TO WESTERN MANUFACTURED IRON.

It is the general impression in trade circles that the quality of the manufactured iron now made is improving. Consumers are now more exacting in their requirements, the practice of testing has grown quite general, and greater intelligence now prevails among all classes of manufacturers. More attention is paid to the scientific features of the business. Chemical formulas are no longer regarded with contempt. Raw materials are purchased with some discrimination, the effects of different fuels are carefully noted, and rule-of-thumb has to a great extent given way to the application of exact knowledge. The gradual disappearance of old iron rails from rolling mill stock piles is also a matter of no small consideration in this question. As long as they were plentiful and cheap there was a constant temptation to use them, as their conversion into other forms of iron was so easy and comparatively so inexpensive. The passing away of the old-rail era together with the growth of scientific knowledge relative to iron making could not fail to effect a great improvement.

This improvement has been especially noticeable in the manufacture of bar iron in the West. For example, common bar iron of Western make is no longer the despised article that it was but a few years since. At that time a storm of indignation was evoked when the charge was made that a Chicago fire-escape manufacturer was using common bar iron in building structures upon whose strength many lives might depend. The common bar iron now made easily meets the requirements of agricultural implement manufacturers and has further been known to endure the exacting tests of the most rigid railroad inspectors.

Notwithstanding this array of argument, apparently proving that the quality of the iron now made is better than ever, it is the opinion of experts that the limit of improvement has been reached, unless consumers are willing to pay greatly enhanced prices. Further improvement in quality is to be gained by reworking, thus making the product more homogeneous, but decidedly more expensive. In this event, however, the consumer naturally turns to steel, which will meet his requirements at a less price. The quality of steel is shown to be steadily improving, and, unlike iron, it has a free field which it will enjoy until some other metal or alloy is found possessing greater merits, and is available at a reasonable price. The improvement in the quality of the steel made in the past five years is very remarkable. No longer are complaints made of the mysterious cracking of steel plates, but steam boilers are now almost universally made of steel, and iron ships have completely given way to steel ones. The manufacture of reliable steel plates is no longer confined to one or two works in this country, in which the process almost seemed to be a trade secret, but there are upward of a dozen of them, all ready to meet the most severe specifications, which would be impossible of execution in iron except at very much higher cost.

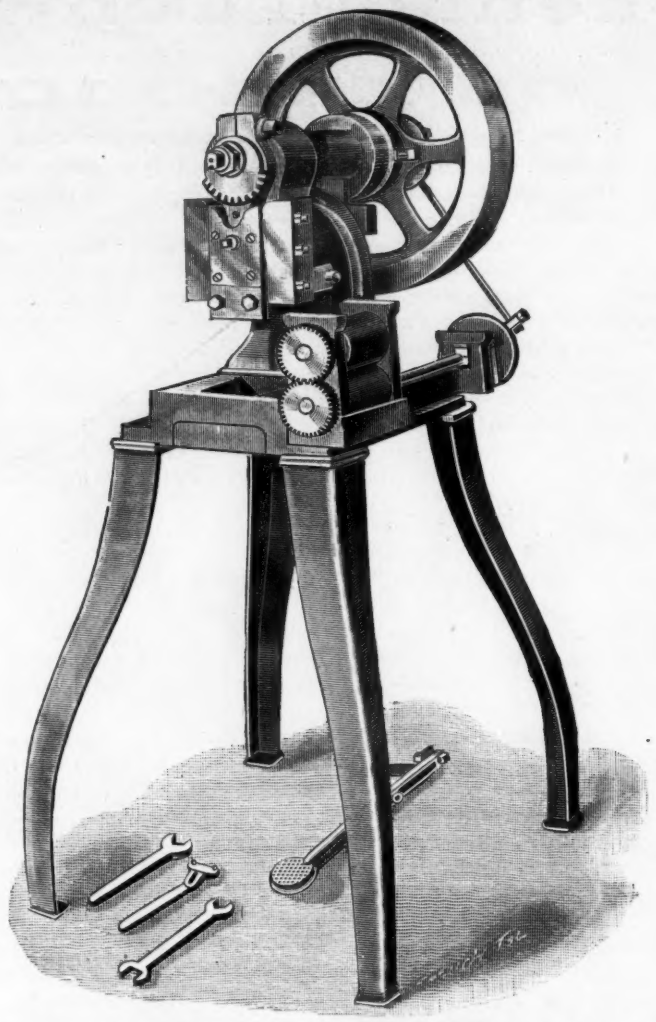
In other branches of the steel trade the number of manufacturers is constantly increasing and the excellence of their product is a matter of wide comment. Who can make good thin steel sheets? was once a live question, butit has now almost changed into, who cannot make good thin steel sheets? In heavy forgings iron and steel have for some time been struggling for the mastery, and each has its advocates. The iron manufacturers say that they find the quality of the scrap now in the market so irregular that they can no longer depend upon it, and they will only guarantee their work when made from re-worked muck bar, which is necessarily expensive, and the result is that they are themselves turning to the use of steel. In fact, the inference seems to be unavoidable that steel is making greater headway than ever in all branches of trade in which reliability and excellence of quality are sought.—[Iron Age.

A Million-Dollar Steel and Tinplate Enterprise.

Particulars are given in a letter from Savernake, Va., of the organization of a million dollar company to build steel and tinplate works at that place. The directors are leading American and English business men, many of whom are already closely identified with the iron trade. It is an enterprise of great magnitude, and it must prove of immense value not only to Savernake, but to the whole South, for the successful operation of steel and tinplate works at that point would command wide attention throughout the country.—[Manufacturer's Record.

A CONVENIENT SMALL POWER PRESS.

We herewith illustrate a small power press manufactured by the Toledo Machine & Tool Co., Toledo, O. This press is known as the No. 25, and is especially adapted for light punching, such as small parts of sewing machines, hardware novelties and specialties, and though a very small machine it is a very powerful one, and will punch a quarter-inch hole in quarter-inch iron, besides being a very rapid and accurate working machine. The shafts are made of forged steel, the crank connection, or yoke connecting shaft to slide, is made from steel castings, clutch parts, etc., from the best cast steel. The



cut shows machine with an automatic roll feed, which is built only to order at an extra cost. This feed is especially adapted for feeding stock from strips or rolls such as brass, light sheet steel, paper, etc. The press is furnished complete with one bolster, wrenches, etc.

We are also informed that this enterprising concern have just completed an automatic link machine for manufacturing steel link belting. The cuts are now being made of this machine, and we hope to illustrate it very soon. Since moving into their new and commodious quarters this young and enterprising concern has made rapid strides toward the front. For prices and particulars of such presses and tools as they manufacture, write the manufacturers.

Forging by Electricity.

In the basement of a great building in Oliver street, Boston, occupied by the Electrical Forging Co., the writer witnessed a free exhibition of forging by electricity which ought to be highly interesting to all railroad men concerned in the working of metals. This is a different process from that of welding by heat generated by the electric current, and is capable of much wider application. The process to be seen in operation at the place mentioned was invented and developed by Mr. Geo. D. Burton, inventor of the well known stock car which bears his name. It is only a short time since this system of forging was invented, yet it is already in practical operation heating the iron and steel used in a large manufacturing establishment. Heating metal by the electrical current has been practiced for years in an experimental fasion, but it was always found that the heat was not uniform, which prevented useful application of the process except for welding, which was practical, through the tendency of the end of the bar to become hottest. Mr. Burton worked out the process, by which any part of the whole of a bar could be raised to a uniform heat, and electrical forging become an accomplished fact. In the establishment at Boston I saw bars of iron and steel put in the electrical apparatus, and in a few minutes raised to the forging heat, then passed under dies, rolls or other shaping devices, and passed out in the form of spikes, bolts, balls, and other finely finished articles.

The parties controlling this process claim that by using electricity as a heating medium and then subjecting the heated parts to pressure, the particles or molecules of the metal are more firmely united, thus making cutting edges susceptible to a better temper and finer finish. The claim is also made that the metal heated by electricity and forged under that heat is stronger than similar metal heated in the fire. A claim readily admitted is that it wastes little or no material, while accomplishing many things heretofore deemed impossible, and is so quick and accurate in its operation that its productive capacity is far in advance of any other process in mechanics. It saves labor, material and time, and reduces the cost of production so that it must inevitably control the manufacture of any article that can be produced by it.—["A. S.," in National Car and Locomotive Builder.

PORTABLE RAILROAD DRILLING MACHINE

The accompanying illustration represents a new drilling machine for railroads of all kinds as well as bridge builders and structural work. It is intended to do the work and take the place, so far as possible, of the slow ratchet drill. It will do the work of a ratchet drill in less than one-fifth of the time. Where it is necessary to drill a rail and have it in place at a certain time, a saving like the above in time is of great value. This machine is built strong enough for any work about a railroad yard or railroad, and is provided with trucks so as to be easily moved from place to place. This machine has automatic feed with four changes; it is double geared, so when the crank is put on the balance-wheel shaft the power is doubled. The balance-wheel also has a handle on rim (not shown in cut) so that two can work at one time. It will drill 0 to 1¼ inch hole. The spindle has a run of 4 inches and there is a

hand wheel provided for quick return of same. The drill socket takes 41-64 straight round shank; it can be removed and another size shank or a universal chuck put on in its place. A valuable feature of this machine is the grinding attachment. Very much time is lost in taking drills off somewhere to be ground; but with this machine the drills can always be kept sharp, thereby saving an immense amount of time and labor. A rubber pulley is brought in contact with the balance-wheel by turning a thumb-nut, and released in the same way. The emery wheel has 17 turns to one of the crank, giving great speed to the emery wheel with very little outlay of strength. The chuck for holding the rail can be removed and a great variety of work can be drilled. This machine will also make a good bench drill by removing it from its base and bolting it on a bench. The trucks are 6 inches in diameter with 2¼ inch face. Weight, 200 lbs. Address the manufacturers, George Burnham & Co., Frank Reed, Proprietor, No. 15 Hermon street, Worcester, Mass.

The Swelling of Steel.

It is well known that steel or iron will swell more or less when heated, but it is not so well known that this property can be made use of to good advantage at times. The crank pin of an engine had been turned a trifle too small, so that the fit could not be depended on if put in in the usual way. The crank pin was small, so the loss would not have been great if it had been thrown away, but they were in a hurry for the engine and the time that would be lost was of more consequence than the price of a new crank pin, but it was thought that they could save it by utilizing the swelling property of the steel. The crank pin was heated a trifle and the surface covered with soap to prevent scaling, after which it was heated a little more, but not enough to redden it or raise a scale. After soaking at this heat for awhile it was cooled off and found to have swelled nearly enough to make a good driving fit. Another heating was given it. It was then found to have swelled all that was required and a little more than was necessary. The pin was then put into the lathe and the surface polished. The crank was heated and expanded by the heat of a gasoline blow-pipe and the pin pushed into place; then both crank and pin were cooled down, and the job was found to be as good as though a new pin had been fitted. The job lasted for over two years and how much longer is not known.—[Stationary Engineer.

Tests of Steel Wheels.

Some tests of the wheels made by the American Steel Wheel Co. have shown remarkable results. In some made at the works in South Boston a 33-inch wheel was placed on two solid iron blocks, rim resting on each block. A weight of 525 pounds, falling 17 feet, struck the hub 25 times without any effect except battering the metal. It was then dropped 10 times on the rim, without a fracture. Then a weight of 1,400 pounds was tried, falling 17 feet, it struck the wheel 11 times but failed to break it. At another exhibit, in order to test the expansion and contraction of the metal, a wheel was buried in sand and a charcoal fire built around the tread until it was brought to a red heat; then it was taken out and exposed to the atmosphere, which had no effect on it whatever. The metal used in this wheel is sound, tough and homogeneous throughout, and makes a very superior Miller draw-hook and M. C. B.'s coupler.—[Railroad and Engineering Journal.

STEAM USERS Should Read this.
Increase the Capacity of your Boilers.
Scale is a Non-conductor of Heat.

SAVE YOUR FUEL AND PROTECT YOUR BOILERS FROM SCALE AND GALVANIC ACTION OF WATERS. WATERS ANALYZED **FREE** AND THE COMPOUNDS MADE TO SUIT EACH WATER.

INTERNATIONAL BOILER SOLVENT.
(PURELY VEGETABLE.)

Dearborn Drug & Chemical Com'y,

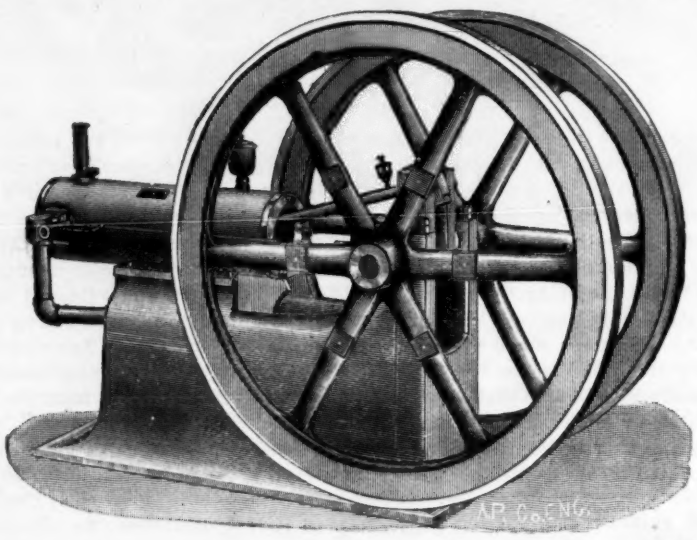
Manufacturing and Analytical Chemists, W. H. EDGAR, Manager. Office, Room 29, Rialto Building; Works, 4246 Champlain Avenue;
Ohio Office, Canton, O. ROBERT H. CREVOISE, Agent.
WRITE FOR INFORMATION AND PRICES. BEWARE OF INFRINGEMENTS.
CHICAGO, ILL.

THE WHITE & MIDDLETON GAS ENGINE.

The very simple and attractive little engine herewith shown is so fully and satisfactorily described in the report of the judges at the 59th National Industrial Exhibition of the American Institute, 1890, that we quote the remarks below:

"After a full and impartial examination of the articles above described, the undersigned judges make report that: This is a compression gas engine, rated nominally as 8 I. H. P., the invention of Charles White and A. R. Middleton, and built by them at Baltimore, Md. The cylinder is 6″ diameter and 12″ stroke. The piston is of the trunk pattern, connected to the crank direct by wrist-pin and connecting rod, without cross-head. The exhaust ports are uncovered by the piston at its extreme out-stroke and the balance of the burnt charge remaining in the cylinder at atmospheric pressure (except that filling the explosion chamber) is expelled through the air inlet valve and auxiliary puppet valve back of same.

"The engine has two 56″ fly-wheels, each weighing 625 pounds, and is mounted on a substantial covered bed with cylinder projecting over back end of same. Its cycle or method of work is the same as the "Otto" and other familiar gas engines, viz: A mixture of gas and air is drawn into the cylinder



by the out-stroke of the piston, is compressed in about proportion of four to one by the following in-stroke, and is ignited on the centre by uncovering the inlet to an incandescent closed tube. The charge being exploded and the impulse received on the out-stroke the products of combustion (or upwards of three-fourths of same) are expelled by the following in-stroke and a fresh charge of mixture taken in by the next out-stroke.

"This engine, since the opening of the exhibition, has been running a C. & C. 7 H. P., or 75-light dynamo, belted direct from the fly-wheel of the engine, running usually at 212 revolutions; the dynamo making 1,750 revolutions, and supplying 61 incandescent lights and running also a 12″ fan at 1,400 revolutions through a small electric motor. We tested this engine by request of the agents, Messrs. Jeffers & Kumberger, under brake power with the following results; Duration of test, 10 minutes; average speed, 215 revolutions per minute; actual brake H. P. developed, 5.98; consumption of gas during 10 minutes, 19 cubic feet; consumption of gas per brake H. P., 19.06 cubic feet.

"In running the engine without load, the engine required at nominal speed a charge of mixture (as shown by the operation of the governor) once in ten revolutions, showing the friction to be 20 per cent. This, if the same percentage held good under a load, would give the engine during the test an estimated 7½ indicated horse-power, which would show a consumption of 15.2 cubic feet of gas for each indicated horse-power, which is an economy, so far as we know, never before reached in any gas engine. The brake lever used in this test was the ordinary wood clamp (balanced) 4 feet 3½ inches, from the center of engine shaft to the point of contact by a steel pin on the scale, which was an ordinary Fairbanks grocer's platform scale. The scale showed 34 lbs. balanced continuously during the test and kept balanced by tightening or loosening the brake. The speed varied from 202 to 225 revolutions, but averaged 215. The gas meter used was a 45-light meter made by Harris Griffin & Co., of Philadelphia, Pa., and was guaranteed as correct by the New York Mutual Gas Light Co.

"We are thus explicit in giving the details, as the result shows a hitherto unattained economy in gas engines. The heat generated on the pulley by the brake prevented our continuing the test for a longer time. It is to be regretted that want of time and proper appliances prevented our making a test with the indicator, which would be more satisfactory, and by which in connection with the brake the real economy of the engine could be more clearly shown. Some of the features of this engine deserve special commendation. The governor is a novel, and very neat and effective regulation; the incandescent closed tube igniter also worked with a positive and prompt ignition without the loss of a single charge, even under a speed of 280 revolutions. The tube is a ⅛″ gas pipe, 9″ long, closed at the top and screwed into the cylinder, being kept red hot by a bunson burner surrounding it. Its inlet to the cylinder is opened through a port by a small cylindrical steel valve which is forced back by the piston just as it reaches the limit of its compression in-stoke. As this valve uncovers the inlet port to igniter tube, the charge of mixture under heavy compression rushes up into this incandescent pipe and is ignited. The engine ran smoothly, either with or without load, and is of first-class workmanship."

The judges, J. F. Place, Joseph Boyce and George H. Kearney recommend the award of the medal of superiority.

The claims made for this engine are: That it will consume 25 per cent. less gas, will run more steadily, will make less noise, will require less attention, can be more easily kept clean, has less parts, and is less liable to get out of order than any other gas engine. The manufacturers are the White & Middleton Gas Engine Co., Baltimore, Md., and the General Agent for Northern Ohio is Mr. M. P. Satterthwaite, 173 Superior St., Cleveland. Mr. Satterthwaite also represents the Lodge & Davis Machine Tool Co., the Barnard Engineering Co. (vacuum system of steam-heating without pressure), the Otto Gas Engine Co., the Lawson Gas Engine Co., G. W. Baker & Co. (exhaust and ventilating fans), and the Leffel Water Wheel & Engine Co.

American Pig in Eastern Canada.

Cheap American pig iron is an undoubted factor as a source of supply in Western Canada, but it remains to be demonstrated yet whether it can successfully compete with low grade English iron in the eastern section convenient to point of debarkation from ocean steamers. This result is apparently as far off as ever, and it is doubtful, considering the disadvantages to be overcome, that it will ever become a serious factor in the connection mentioned. This was illustrated pretty plainly within the past few weeks, when attempts were made to place some cheap lots of American pig on the Montreal market that proved unsuccessful. For it was found that, although the stuff could be laid down in Toronto and the West at a figure which permitted effectual competition with British, the reverse was the case when it came to a question of selling further East. The fact is, the increased freight called for by the additional trip from the West to Montreal is too serious a disadvantage to permit of the result wished for by the sellers in question, and it seems unlikely, unless they can effect some peculiar and particular arrangement with the railroad companies, that they will ever attain their object. Induced by the prospect of higher values on the lower grades of English iron, the attempt was made without result, and it will take a very substantial and unlikely advance in the British iron before it will cost more to lay it down in Montreal than American stock of the same class. In fact, such an event is extremely unlikely, and with allowances for the increased cost, advance in ocean freight, etc., low grade British iron is likely to remain the chief source of supply for Eastern buyers who fill their wants from this description of material. It is worthy of note also that higher values are anticipated across the line as soon as the long-looked-for improvement in steel rails and track material occurs. Then, too, all the bargains that have been knocking about the American market are said to be pretty well weeded out, and any business from now out will have to go forward on the basis of regular market quotations.—[Hardware, Toronto.

The Scotch Shipbuilding Trade.

There has been some activity in the Scotch shipbuilding trade, and the tonnage fixed during the week cannot be less than 25,000 tons. It is said, however, that the quotations have all been based on low prices for raw materials and the recently reduced scale of wages. The shipbuilders in the north-eastern ports are as well employed as any people engaged in trade, but as much cannot be said of the prices they get. Shipbuilders on the west coast are in fair employment, but new orders are not coming to hand with much briskness at present. Engineers in the north are not so well off as they were. Scotch engineers have been getting more to do, especially those making a specialty of marine work. Ironfounders seem also to be getting more hopeful in tone, and several inquiries are in the market for pipes. Engineers, ironfounders, and boiler-makers in the north-west have a fair amount of work in hand. There is no material change to report with regard to the engineering industries of Lancashire. In most departments works are still kept well engaged upon orders in hand, but the general reports are that there is a decided slackening off as regards new work coming forward.—[Iron and Coal Trades Review, Sept. 18.

PROTECTING YOUR BUILDING With an automatic fire sprinkler system makes it absolutely fire proof. All Insurance Companies recognize the "Neracher" as the best made and will make liberal reductions on your present rates if you equip. In this way the system pays for itself inside of two years' time.

☞ Write us.

THE NERACHER SPRINKLER CO., - WARREN, O.

BRANCH OFFICES:

Boston, Chicago, St. Louis, Cleveland, Cincinnati, Minneapolis, Pittsburgh, New York, Philadelphia, Baltimore, San Francisco.

IRONWORKERS IN AMERICAN HISTORY.

In our researches into the history of the manufacture of iron and steel in United States we have been impressed by the fact that many of the men who have been prominent in shaping the destinies of the country, either as soldiers or statesmen, have also been prominent as manufacturers of iron and sometimes also of steel. Among the ironmasters and ironworkers in colonial times we find the names of Sir William Keith, Governor of Pennsylvania; Colonel Alexander Spotswood, Governor of Virginia; Captain Augustine Washington, the father of George Washington and his two elder half-brothers, Lawrence and Augustine Washington; Colonel Ethan Allen, General Daniel Morgan, and General Nathanael Greene, of the Revolutionary army; and Stephen Hopkins, George Taylor, George Ross, and James Smith, signers of the Declaration. Benjamin Franklin was the inventor of the Franklin stove. Since the Revolution we find that a still larger number of our public men have been identified with our iron and steel industries, many of whom have been members of Congress and Governors of States. Henry Baldwin, one of the Justices of the United States Supreme Court; John Henry Hopkins, Episcopal Bishop, of Vermont; and General Arthur St. Clair were Pennsylvania ironmasters early in the present century.

The close connection of the Washington family with our colonial iron history is a fact of special interest to all who care anything about the early history of our iron and steel industries. Captain Augustine Washington was engaged in making pig iron at Accokeek Furnace, in Stafford county, Virginia, about 15 miles from Fredericksburg, when his son George Washington was born. This furnace had been built by the Principio Co., composed of English capitalists, as early as 1726, on land owned by Augustine Washington, aggregating about 1,600 acres and containing iron ore, Captain Washington becoming the owner of one-sixth of the furnace property in consideration of the transfer of his land to the company. The Principio Co. had other iron enterprises in Maryland. Captain Washington appears to have visited England in 1729 and 1730 in relation to the furnace management. During his absence his wife died, but this event causes no touch of pathos in a letter from John Wightwick, one of the English stockholders in the Principio Co., written at London on Oct. 2, 1730, and addressed to John England, the company's general agent in Maryland and Virginia. From this letter we quote literally as follows:

"You remember what steps we made with Captn Washington in order to his management at Accokeek, which we did suppose when he arrived there, & after he had agreed with the founder as to the quality of the pig metall, he would have given orders to his agent here to have exchanged the articles with us (which he left ready executed for that purpose) and on your arrival in Virginia to see the stock valued and to have the proper securities given for his returning it to us at the end of his term, he would have entered immediately on that work according to our agreement in the said articles, but we have Ltres. from him of the 10th of July in which he says that on his arrival, to his great grief, he found his wife was dead; that he had been at the furnace, and that we might depend of his using as much prudence and caution 'till your arrival as if it was for himself, but says not one word whether he would take to his bargain with us or not, having had sufficient time to consider of it between the 26th May the time of his arrival & the 10th July the date of his letter. I think this is treating us neither kindly or Honorably to leave us in so great a state of uncertainty. As to Mr. Gee he says he is on this account very unwilling to have anything to do with him. As to Mrs. [Messrs.] Chetwynds and myself, & I believe Mr. Russell, we shall submit to what you shall advise us in case when you come to talk with him you find him inclined to pursue his bargain. If you find he does not pursue his bargain, I don't doubt but you will settle our affairs there on as good a foot as the nature thereof will allow, and I hope by the help of N. Chapman and your directions that work will be as well managed as if Captn W. undertook it."

Nathaniel Chapman was the clerk at Accokeek furnace. We have been unable to discover whether Captain Washington kept his "bargain" to manage the furnace or not, but in Colonel William Byrd's "Progress to the Mines," written in 1732, he mentions "England's iron mines, called so from the chief manager of them, though the land belongs to Mr. Washington." Two miles distant from the mines was the furnace. Colonel Byrd says: "Mr. Washington raises the ore and carts it thither for 20 shillings the ton of iron that it yields. Besides Mr. Washington and Mr. England there are several other persons in England concerned in these works." Gee, Russell, Wightwick, and the Chetwynds were among these "other persons."

When Augustine Washington died in 1743 he was a stockolder in all the possessions of the Principio Co., which he bequeathed to his son Lawrence, who died in 1752, bequeathing to his daughter Sarah his interest "in the Principio, Accokeek, Kingsbury, Laconshire and Northeast iron works in Virginia and Maryland." George Washington was one of the executors of this will. Sarah dying soon afterwards her iron interests were conveyed, by the terms of her father's will, to her uncle, Augustine Washington. At the breaking out of the Revolution "a certain Mr. Washington" owned a one-twelfth interest in all the possessions of the Principio Co. He was probably a son of George Washington's half brother, Augustine Washington. We have in our possession a pig of iron which was made at Principio furnace in 1751 when Lawrence Washington was one of its owners.

In 1731 Captain Augustine Washington married for his second wife Mary Ball, a daughter of Joseph Ball, who resided in Lancaster county, Virginia, forming a part of "The Neck." It was in this county that Mary Ball was born. Captain Washington's home was in Westmoreland county, and it was here that Mary Washington's first child, George Washington, was born, as all the world knows, on February 11, 1732–2, old style. The facts which we have presented show that the future Father of his Country was the son of a Virginia ironmaster, and that both his half brothers and other relatives were also ironmasters.

Abraham Lincoln's paternal ancestry was also identified with the manufacture of iron. It is not so generally known as it should be that his ancestors on his father's side were natives of Massachusetts and were among its pioneer ironmasters. In "Johnson's Clyclopœdia" there is preserved a biographical sketch of Abraham Lincoln, written in 1859 with his own hand, in which occurs the following reference to his father's family:

"My paternal grandfather, Abraham Lincoln, emigrated from Rockbridge county, Virginia, to Kentucky, about 1781 or 1782, where a year or two later he was killed by Indians—not in battle, but by stealth, when he was laboring to open a farm in the forest. His ancestors, who were Quakers, went to Virginia from Berks county, Pennsylvania. An effort to identify them with the New England family of the same name ended in nothing more definite than a similarity of Christian names in both families, such as Enoch, Levi, Mordecai, Solomon, Abraham, and the like."

Researches which have been made since Abraham Lincoln became President clearly establish the fact that the head of the American branch of his father's family, Samuel Lincoln, emigrated from Norwich, England, to Massachusetts, whence two brothers, who were his grandsons, emigrated to Pennsylvania, one of whom was the President's great-great-grandfather.

A communication to the Hingham *Journal* of October 10, 1879, says that among the early settlers of Hingham, Massachusetts, which was settled in 1635, were seven persons named Lincoln who became the heads of families. Four of these were named Thomas. Samuel Lincoln, who came to Hingham in 1637, had four sons, Samuel, Daniel, Mordecai and Thomas. Mordecai Lincoln, born in Hingham on June 14, 1657, learned the trade of a blacksmith, and was "a large contributor toward the erection of the iron works at Bound Brook" in 1703. His brother Daniel owned a one-eighth interest in the works. These Bound Brook Iron Works comprised nothing more ambitious than a Catalan forge. They were located at or near the line dividing Scituate from Cohasset. Cohasset until 1770 was the easterly precinct of Hingham.

Mordecai Lincoln's first wife was Sarah Jones, the daughter of Abraham and Sarah Jones of Hull. Their sons were Mordecai, Jr., born April 24, 1686; Abraham, born January 13, 1688 9; and Isaac, born October 24, 1691. The Hingham *Journal* says that Mordecai, Jr., and his brother Abraham removed to Scituate "it is supposed" to Pennsylvania, for their names afterwards appear among a list of taxables in Exeter township, Berks county, Pennsylvania. But first they emigrated to New Jersey, according to various authorities which we have not room to quote. Nicolay and Hay circumstantially state in their life of Lincoln that Mordecai Lincoln removed from Massachusetts to Monmouth, N. J., and thence to Amity township, Berks county, Pa., where he died in 1736. His brother Abraham appears to have finally settled in Springfield township, Chester county, Pa., as early as 1729. He was a blacksmith. He died in 1745. The townships of Oley, Amity and Exeter, in Berks county, are contiguous, and in their early records the name of Lincoln often appears. Monmouth county, N. J., was settled in part by a colony of

CENTRAL THOMSON-HOUSTON COMPANY,

48 ARCADE, CLEVELAND, O.

S. D. NESMITH, - - - - - Manager.

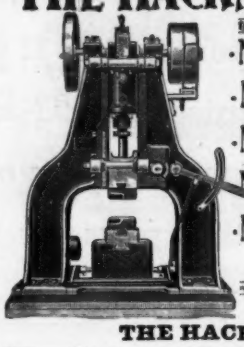
Motors from 1-12 h. p. to 100 h. p.

ELECTRIC LIGHT PLANTS INSTALLED,

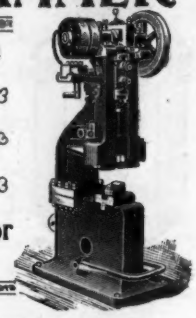
Arc and Incandescent, Direct and Alternating,

ELECTRIC FANS!
FANS FOR VENTILATING!
ELECTRIC SUPPLIES.

·THE HACKNEY POWER HAMMER·



·No Rubber Cushions to wear out.
·No Straps to break.
·No Springs to crystallize.
·No adjustments to be made.
·No alteration in speed for light or heavy blow.



THE HACKNEY HAMMER CO., CLEVELAND, O.

Massachusetts people, who erected iron works at Tintern Falls in the township of Shrewsbury about 1676. It is probable that the Lincoln brothers emigrated to this county because Massachusetts people were there already and because they were themselves ironworkers.

Mordecai Lincoln, who emigrated to Berks county, Pa., and died there in 1736, and who was a Quaker, left three sons, John, Mordecai and Thomas, and probably, as a communication in the Philadelphia *American* says, a posthumous son named Abraham. A posthumous child was provided for in Mordecai Lincoln's will. John Lincoln emigrated to Rockingham county, Va., about 1750. He had a son Abraham, who emigrated to Kentucky and was killed by the Indians, as the President states. This Abraham was the grandfather of the President, his father being Thomas Lincoln.

An Abraham Lincoln, of Berks county, who was either the posthumous son of Mordecai Lincoln or his grandson, was long prominent as a politician. He was one of the county commissioners of Berks county from 1773 to 1779, and from 1782 to 1786 he was a member of the General Assembly of Pennsylvania. A letter from Reading, published in the Philadelphia *Press*, says that after his service in the Assembly, Abraham Lincoln was a justice of the peace and ex officio one of the justices of the Quarter Sessions. "His signature, which can be found attached to various ancient documents in the commissioners' office, indicates that he was a man of affairs, and it is not unlike that of his illustrious namesake which is attached to the Proclamation of Emancipation." He was a member of the State Convention of 1787 which ratified the Federal Constitution of that year, and which he voted against, and he was an influential member of the State Constitutional Convention of 1790. He died in 1806 in his 70th year, having been born in 1736.

A communication in a late issue of the Philadelphia *Ledger* says that there is still an Abraham Lincoln living in Pennsylvania. He lives in Cærnarvon township, Lancaster county, about 14 miles from Reading, and is about 80 years old. Other Lincolns are still living in Berks county.

Nancy Hanks, the mother of President Lincoln, was descended from a Berks county family, which emigrated first to Virginia and afterwards to Kentucky.—[Bulletin of the American Iron and Steel Association.

A Gigantic Power Plant.

A Boston special, September 28, says: The largest fly-wheel in the United States turned this morning in response to the touch of Henry M. Whitney, of the West End Street Railway Co. In other words, the first big engine in the new power-house of the road was started to-day. This house is designed to furnish the electric power for running nearly all of the street cars in Boston. This central power station concentrates in one place a greater amount of horse-power than is known anywhere else in the world. The boiler house is 160 feet long by 80 feet wide, and designed to contain 24 boilers, which will supply steam for 13 engines in the power-house. These engines are of the triple expansion type, and of sufficient capacity to develop at a maximum 2,000 horse-power each, making the total capacity of the station 26,000 horse-power. This, added to the capacity of the Cambridge station, will make on the completion of the proposed extensions a total of 34,000 horse-power, sufficient to run 1,700 long cars. This gigantic plant is, however, only about half completed at present, enough to operate 850 long cars. The countershafting in the basement will be when completed the largest piece of work of this kind that has ever been built, and is designed to transmit the power of the engines to the generators on the floor above. These generators, now in process of construction by the Thomson-Houston Co., will be the largest street railway generators that has ever been built. The water for condensing purposes, of which 20,000,000 gallons a day will be necessary, is obtained from the South Bay through 36-inch cast iron pipes entering the end of the power-house.

The promised article by Hiram S. Maxim, the inventor, on "Aerial Navigation," appears in the October *Century*, and considers particularly the question of the power required for navigation. Mr. Maxim discusses the philosophy of the subject and relates the progress of his experiments at Kent, England, which are illustrated with drawings of the machine employed. He also adds a forecast of the possible future uses of the new mode of locomotion. The paper in the Gold-Hunting Series is entitled "Tarrying in Nicaragua," and is a record of the California trip in 1849, as told in the letters of the late Roger S. Baldwin, Jr., one of a party of Yale graduates who went to the Pacific by this route. Colonel E. V. Sumner, of the army, gives a graphic account of the Indian massacre of 1879 under the title "Besieged by the Utes," to which Mr. Remington lends the aid of his pencil. J. G. Nicolay writes of "Lincoln's Personal Appearance," and General H. V. Boynton discusses "The Relation of the Press and Public Men." In "Topics of the Time" are editorials on "A Cheap-Money Retrospect" "Presidential Voting Methods," "The Key to Municipal Reform," and a tribute to Mr. Lowell as poet and citizen.

INDUSTRIAL SUMMARY.

New Enterprises:—

Report says that the Moundsville Mining & Manufacturing Co. will establish tool works at Moundsville, W. Va.

Wooster & Wilcox will operate a foundry and machine shop at Winsted, Conn., where a suitable plant is being erected.

Benjamin Haugh will erect works at Louisville, Ky., for the manufacture of a railroad car wheel, for which he has received a patent.

The American Car Co., of St. Paul, Minn., has been incorporated by W. Ruttom, Emil Alexander, T. Papin, Jr., with a capital stock of $100,000.

The Western Foundry Co. has been organized at Covington, Ky., James Tully, President, to operate a foundry for making large and small castings.

The Shendun (Va.) Machine & Repair Shop has been chartered, with $25,000 capital, to make machinery, operate an iron and brass foundry, etc.

S. T. Williams, of 447 North street, Baltimore, Md., is endeavoring to organize a stock company, for the purpose of manufacturing his steam engine.

The Pneumatic Standard Railway & Gate Manufacturing Co., Chicago, has been incorporated; capital, $300,000; incorporators, Edward Oates, W. O. Osgood and John Irvine.

At Covington, Ky., L. J. Hunter, G. W. Evans and H. C. Hunter have incorporated the Lythe Safe & Lock Co. to manufacture safes, vaults, locks, etc; authorized capital stock, $100,000.

The Gray Electric Co. has bought fifty acres of land in Highland Park, near Chicago, and will build works for the manufacture of electrical appliances, as well as dwellings for employes.

W. H. Harris, J. O. Lee, J. M. Frazee and others have incorporated the Maysville Fuel, Light & Steel Co, with a capital stock of $100,000, for the purpose of erecting a steel plant at Maysville, Ky.

The Champion Saw Co., of New Brighton, Pa., have been incorporated, with a capital stock of $60,000 The incorporators are F. G. Rorhkaste, New Brighton, Pa; J. D. McAulis, New Galilee, and J. W. Forbes, Beaver Falls, Pa.

The Northey Manufacturing Co., Toronto, has been incorporated, with a capital stock of $100,000, for the manufacture of steam pumps, machinery, engines, etc. This is an expansion of the business of the well-known firm of Northey & Co.

The State Construction Co., of Chicago, has been formed, to manufacture and deal in rolling stock and machinery for street railways, and to build street railways; capital stock, $1,000,000; incorporators, Houston C. Adcock, Nathan G. Moore and Edward P. Town.

The D. & D. Electric Manufacturing Co, of Minneapolis, Minn., has been organized with a capital of $50 000. It will manufacture and sell electric motors, dynamos and other electric appliances. Gilbert Donaldson and Thos. Davis, of St. Paul, and Frederick G. James, of Minneapolis, are the promoters.

The Tell City Fifth Wheel Manufacturing Co. have been incorporated at Tell City, Ind, with a capital stock of $30,000. The company will manufacture fifth wheels, carriage supplies and all kinds of castings and machinery. Jacob Miller, formerly of the Jacob Miller Fifth Wheel Manufacturing Co., of Elizabethtown, Pa, is manager of the new company.

The Cash Safety Car Co., of Portland, Me, has been formed for the manufacture of railway gates. Dean Peabody, Geo. H. Chadwell, Francis C. Cash, Joseph W. Harding, Chas. H. Welch and Chas. B Lord, of Lynn, Mass.; W. G. Ellis, of Amesbury, Mass., and Edward K. Butler, of Boston, Mass., are the stockholders, the last mentioned being president of the company.

Additions, Enlargements, Removals, etc.:—

A new machine shop has been added to the plant of the Linwood Iron Co., at Linwood, Pa.

The American Arms Co., of Boston, Mass., manufacturers of fine arms, intend removing to Bluffton, Ala.

Work on a hammer shop, a producer house and a boiler house to be added to the Boles Steel Car Wheel Co.'s works, at Scranton, has been begun.

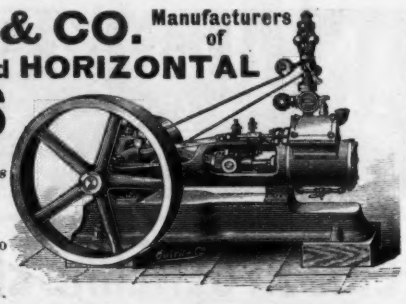
The Foster Machine Co, now of Springfield, will remove to Westfield, Mass., where a new factory will be erected and the works operated by water power. The main building will be 150x50 feet.

The Briggs Rolling Mill Co., of Findlay, O., will erect a muck mill and merchants' department building at the junction of the Lake Erie & Toledo Railroad, to be 280x300 feet, two stories, and to cost $10,000.

The Puget Sound Iron Co., Seattle, Wash., have filed articles of incorporation. The capital stock is fixed at $1,000,000, divided into 10,000 shares at $100 per share, and the right is reserved to increase the capital stock to $2,500,000.

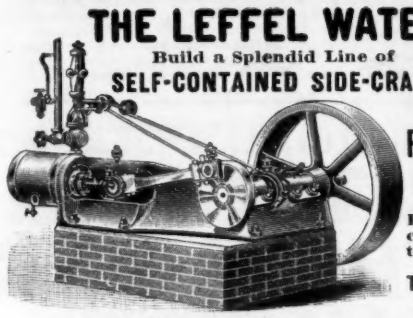
The Cleveland Rolling Mill Co. are about to make some extensive additions to their Newburg mills. The additions will consist of a new Bessemer

THE JAMES LEFFEL & CO. Manufacturers of
IMPROVED UPRIGHT and HORIZONTAL
ENGINES & BOILERS
3 TO 26 HORSE POWER.
STRONGLY BUILT on BEST Principles for SMOOTH and ECONOMICAL WORK.
Over 4000 in Use.
Write for free PAMPHLET and state your wants to
THE JAMES LEFFEL & CO.
SPRINGFIELD, OHIO or NEW YORK CITY.



ROLLS. ESTB. AND 1863 PINIONS.
THE TOTTEN & HOGG IRON & STEEL FOUNDRY CO.
OFFICE & WORKS
24TH ST & A.V.R.R.
PITTSBURGH, PA
CHILLED & SAND ROLLS
ROCK CRUSHERS,
SHEARS SQUEEZERS AND ROLLING MILL MACHINERY.

THE LEFFEL WATER WHEEL & ENGINE CO.
Build a Splendid Line of
SELF-CONTAINED SIDE-CRANK ENGINES
AND
RETURN FLUE BOILERS
8, 12, 16 and 20 Horse Power.
High in Grade. Low in Price. Strictly First-class. In design and construction SUPERIOR to all others. Write for ENGINE PAMPHLET.
Address us in full as follows:
THE LEFFEL WATER WHEEL & ENGINE CO.
Greenmount Ave., SPRINGFIELD, OHIO, U.S.A.



steel plant for the manufacture of beams and other heavy merchant iron. It is said the plans are prepared, and the plant when completed will give employment to many additional men, and will undoubtedly cost about $125 000. They also expect to put up another rod mill for the making of wire. This other extension will give the Cleveland Rolling Mill Co. one of the largest wire plants in the United States. It is intended to so build the mill that the wire as turned out can be passed into the cleaning house by one continuous motion, thus doing away with much teaming work. These improvements will cost in the neighborhood of $50,000.

Fires and Accidents:—

The Lexington, Ky., foundry has been burned. The foundry had only been built about a year, and the loss is placed at $20,000.

The machine shops of the Norfolk & Western Railroad, Shenandoah, Va., have been destroyed by fire, together with all the machinery and supplies, entailing a loss of $75,000.

General Industrial Notes:—

The New Castle Wire Rod Mill again broke the record last week. In one day the output was 253 930 pounds of marketable rods, or nearly 127 tons. The greatest output of the establishment one day prior to this was 250,000 pounds.—[New Castle (Pa.) Guardian.

Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until 2 o'clock P. M., on the 20th day of October, 1891 for all the labor and materials required to remove old heating apparatus, and fix in place complete, a new low pressure, return-circulation, steam-heating apparatus for the United States Custom House, etc., building at Rockland, Me.

Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until 2 o'clock P. M. on the 27th day of October, 1891, for all the labor and materials required for furnishing and erecting complete one combination steam, freight and passenger elevator, including steam machine, car, guides, steam and dry pipe connections, etc, for the extension of the Bureau of Engraving and Printing Building at Washington, D. C.

The Providence Steam Engine Co., Providence, is changing the drums of the Moore boilers (which were recently set up at the Narragansett Electric Light Co.'s station by the National Water Tube Boiler Co., of New Brunswick, N. J) to the Babcock & Wilcox system. The Babcock & Wilcox Co., of New York has the contract for the alterations, which have been delayed until the job of putting in of 1,120 horse-power of its own boilers was completed.—[Boston Journal of Commerce.

The Moorhead-McCleane Co. has issued a statement showing its financial condition at the close of business on September 1. The assets, which include cash on hand, bills receivable, real estate, blast-furnace property, rolling stock, mill buildings and machinery, galvanizing works, open hearth steel plant, etc., amount to $2,685 923 57; while the total liabilities, including a mortgage of $400 000 against the plant, amount to $1,314 469 45. These figures show that the assets are $1,371,454 12 in excess of the liabilities. Geo. F. McCleane, who has been general manager of the works for a number of years, has resigned his position on account of ill health and will be succeeded by John H. Miller,

THE STIRLING COMPANY
MANUFACTURE
The Safest, Most Economical, Compact and Durable High Pressure
WATER TUBE BOILERS
All Wrought Steel. Large Mud Drum. Perfect Circulation.
By removing four manhole covers access is gained to every part of the boiler.
Dry steam and great economy of fuel guaranteed.
GENERAL OFFICE: Pullman Bldg., Chicago.
PITTSBURGH OFFICE: Lewis Block.
NEW YORK OFFICE: 74 Cortlandt St.
Works: BARBERTON, SUMMIT COUNTY, OHIO.

formerly manager of the galvanizing department. The works continue in full operation with the exception of the blast furnace, which is idle. The creditors have agreed to a five years' extension.

Through a confusion of names, *The Iron Trade Review* of recent date made the statement that John W. Morrison, Jr, of Youngstown, O, and Samuel Luce, of Boston, Mass., had entered into business under the name of J. W. Morrison & Co., to do foundry and machine work. The fact appears to be that Mr. J. W. Morrison, Jr., is proprietor and manager of the Morrison Foundry & Machine Works, of Youngstown, and the firm of J. W. Morrison & Co., iron brokers and coal dealers, also of Youngstown, is composed of John W. Morrison, Sr., and Samuel W. Luce, of Boston. The latter copartnership was recently formed.

The fine new coke blast furnace of the Iroquois Furnace Co., at South Chicago, Ill., was blown in on September 21. It occupies an excelled location on the Calumet river, not far from its entrance into Lake Michigan. Ore vessels drawing 16 feet of water can unload at the company's docks, near the furnace stack. The buildings and equipment are of the most substantial character. The furnace stack is 17x80 feet, steel shell. There are three Cowper-Kennedy fire brick stoves, each 18x75 feet. The plant at present has one furnace stack, but everything has been arranged for two stacks, and the second will be added after the first has proved entirely successful. Foundry pig iron will be made exclusively. The officers of the company are as follows: President, Hay Walker, Jr., Pittsburgh; Treasurer, T. H. Given, Pittsburgh; Secretary and General Manager, C. F. Forster, Chicago; Superintendent, F. M. Kernan, South Chicago. The main office of the company is at Chicago, Room 638, Rookery Building.

The Neracher Sprinkler Co., of Warren, O., have contracted to equip the following properties: Samuel M. Foster, Ft. Wayne, Ind; Ft. Wayne Furniture Co., Ft. Wayne, Ind; Hutchinson Cooperage Co., Peoria, Ill.; Chicago Desk Manufacturing Co., Chicago, Ill.; Gilbert Paper Co., Menasha, Wis; Campbell Manufacturing Co., St. Louis, Mo.; Muskingum Coffin Co., Zanesville, O; Frank E. Block, Atlanta, Ga.; John M. Smyth, Chicago, Ill.; Yeoman Cheseborough Co., Detroit, Mich; United States Treasury Building, Washington, D. C.; Appleton Paper & Pulp Co., Kaukauna, Wis; Hoyt & Potter, Haverhill, Mass.; June Manufacturing Co., Belvidere, Ill.; Saugerville Woolen Co., Saugerville, Me.; Harney Bros., Lynn, Mass. Of a recent fire, the St. Louis Woolen Mills Co. write as follows: "Some ten days ago the second fire took place in the second story of our mill, in a small pine wood partitioned room, termed by us a picker room. The boy in attendance at the picker machine, on the outside of said room, all of a sudden discovered fire coming out of the door, and the entire inside a solid mass of fire. He immediately closed the door, and says he had no more than closed it when the sprinkler on the inside let go, and the fire was out instantaneously. We keep a water barrel and fire buckets within three feet of the picker room door, but must confess these never get a show at a fire; the sprinklers are too rapid for them. We will be pleased to have any person or persons who may be interested in sprinklers call at our office, when we will cheerfully show them the room in which the two fires referred to have occurred, and they can personally see that the sprinkler has not permitted the pine wood partitions to even look smoky. In conclusion will add, we would not be without the sprinkler system under any circumstances."

The Reeves Iron Company.

The Reeves Iron Co., of Canal Dover, O., have recently doubled their capacity for the production of bar iron, and are now in a position to furnish a full line of sizes up to 4½ inch rounds, 4-inch squares and 7-inch wide flats. They manufacture all sizes of Bessemer steel bars and roll light rails running from 10 to 22 pounds per yard. They have also added sheet mills and galvanizing works, which have all the improvements that ingenuity and experience could suggest. Their sheet product Juniata galvanized iron, perfectly leveled, cold-rolled smooth steel sheets, cold-rolled sheet iron, common box annealed sheet iron, and sheet iron and sheet steel for all purposes, from No. 10 to No. 30 gauge. There is no connection now between the Reeves Iron Co., at Canal Dover, and the New Philadelphia Iron & Steel Co., at New Philadelphia. J. E. Reeves, of the Reeves Iron Co., was until recently also president of the latter company, but has now severed his connection with it, and will in future devote himself exclusively to the management of the Reeves Iron Co. The Chicago agency for both these companies has been hitherto held by W. C. Brown, 45 La Salle street, but he has tendered his resignation to the New Philadelphia Co, in order to avoid any conflict of interests, and will devote his entire attention to the business of the Reeves Iron Co. The Western consumers of iron and steel will note the varied character of the product of this company, and the enlarged opportunities which Mr. Brown now posesses to meet their requirements.

Alphabetical List of Advertisers

The star (*) indicates that the adv. appears alternate weeks; the dagger (†) once a month the double dagger (‡) once in three weeks.

	PAGE
Akron Chemical Co.	15
Aitchison, Rob't Perforated Metal Co	15
Adt, John & Son	17
Automatic Time Stamp & Register Co.	14
*Arey, Clarence O.	12
Buckeye Engine Co	20
Burton, W. J. & Co.	14
Bischoff, F. F. & Co	16
Ball, Wood & Co	19
*Berger Mfg. Co	—
Babcock & Wilcox Co.	20
Buffalo Specialty Mfg. Co.	17
Bostwick Steel Lath Co	16
†Butman Furnace Co.	—
Bassett, Presley & Train	15
Cambridge Iron & Steel Co.	13
†Cleveland Electrical Mfg. Co	—
Cleveland City Forge & Iron Co	20
Cleveland Twist Drill Co.	20
Cleveland Iron Mining Co.	13
Cleveland Rolling Mill Co	13–16
Cleveland Desk Co	13
Condit Fuller Co.	13
*Copeland & Bacon	—
Colliau, Victor	15
Canton Iron Foundry Co.	14
Cambridge Roofing Co.	19
Cole, J. Wendell	20
Chester Steel Casting Co.	19
Central Thomson-Houston Co.	10
*Cincinnati Corrugating Co.	—
*Chandler & Taylor Co	12
Coates Oil Burner Co	12
Corrigan, Ives & Co.	13
Deming Co	18
Dearborn Drug & Chemical Co.	8
Dixon, Jos., Crucible Co.	15
Eller, J. H. & Co.	19
Egan Co.	15
Enterprise Boiler Co	20
Edison General Electric Co.	12
Eberts Bros.	20
Eclipse Electrotype & Engraving Co.	17
Frank & Co.	18
Flaherty, J. H & Co	16
Fuller Bros	15
Felkel, F.	16
Fitzgerald, W. T	12
Graham Twist Drill Co	20
Garvin Machine Co	15
*Garfield Injector Co.	10
Garry Iron Roofing Co.	19
Graves, L. S. & Son	15
Gerlach, Peter & Co.	13
Hazelton Tripod Boiler Co.	18
Hutchison, W. S.	20
Harrington & King Perforating Co.	13
*Hodell, H. H. & Co.	19
Hartford Steam Boiler Insp. & Ins. Co.	16
Hackney Hammer Co	10
Hartman Sliding Blind Co.	16
Hercules Powder Co	18
*Holbrook & McDonald	—
*Indiana Machine Works	12
Iron Clad Paint Co.	19
Industry File Works	20
Jones, E. H. & Co	18
Jeffrey Mfg. Co	14
Jenks, James	15
Kanneberg Roofing Co.	19
*Leffel, Jas. & Co	11–19
LaFountaine Mfg. Co	18
Lancaster, James H.	17
*Long Steel & Iron Roofing Co	—
*Leffel Water Wheel & Engine Co	10
Lodge & Davis Machine Tool Co.	15
Murdock, James, Jr.	16
Milton Mfg. Co.	12
*Munn & Co.	—
*Neracher Sprinkler Co.	9
Outhwaite, J. H. & Co.	13
Oglebay, Norton & Co.	13
Oldfield, L. H.	16
Pope, E. C	13
Parkin & Bosworth Co.	20
Palmer, Cunningham & Co	14
Pittsburgh & Wheeling Coal Co.	13
Penberthy Injector Co	20
Pollock, Wm. B. & Co.	18
Rogers & Hubbard Co	12
Rowell, Geo. P. & Co.	12
Reynolds Bros.	20
*Stan Alumin Co.	12
Schleicher, Schumm & Co.	18
Sykes Iron Roofing Co.	19
Sackman, F. A	14
Southwark Foundry & Machine Co.	19
Stirling Co.	11
Stilwell & Bierce Mfg. Co.	20
Spicer Mfg. Co.	12
Shepard, H. L., Agent	16
Spaulding & Metcalf	15
Skinner Engine Co.	19
Stevens, F. B.	15
Toledo Machine & Tool Co.	18
Tod, Wm. & Co.	18
Totten & Hogg Iron & Steel Foundry Co.	11
Van Duzen Gas Engine Co.	17
Upson Nut Co.	16
Union Electrotype Foundry	14
Universal Radial Drill Co.	20
*Wells Machine Works.	12
*Webster, Warren & Co.	20
Webster, Camp & Lane Machine Co.	14
West, Thos. D. Foundry Co.	14
Westinghouse Machine Co.	19

SAMPLES & PRICES ON APPLICATION

ALUMINOUS METAL ROOFING, EAVE TROUGH, CONDUCTOR PIPES, VALLEYS, SHINGLES

NON-CORROSIVE. SUPERIOR TO COPPER AT PRICE OF TIN. REQUIRES No PAINT FOR PROTECTION — SOLE MFGRS. STAN-ALUMIN METAL CO. CANTON-O

EDISON GENERAL ELECTRIC COMPANY,

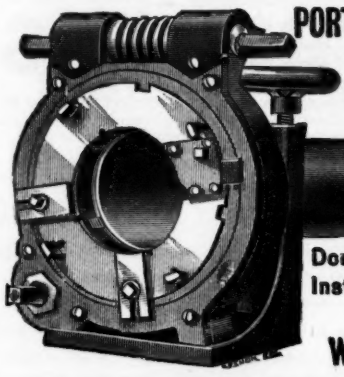
EDISON BUILDING, BROAD ST., NEW YORK.

Electric Lighting.	Electric Motors.	Electric Railways.	Electric Drills.
INCANDESCENT AND ARC. SAFEST AND BEST LIGHT IN USE.	FOR ALL POWER PURPOSES. SAFE AND RELIABLE.	PASSENGER, TRAMWAYS, MINE HAULAGE.	PERCUSSION AND DIAMOND, FOR MINING.

Address Nearest District Office.

DISTRICT OFFICES:

CANADIAN DISTRICT, Bank of Commerce Building, Toronto, Ont.
CENTRAL DISTRICT, 173-175 Adams St., Chicago, Ill.
EASTERN DISTRICT, Edison Bldg., Broad St, New York.
NEW ENGLAND DISTRICT, 25 Otis St., Boston, Mass.
PACIFIC COAST DISTRICT, Edison Bldg., 112 Bush St., San Francisco, Cal.
PACIFIC NORTHWEST DISTRICT, Fleischner Bldg., Portland, Ore.
ROCKY MOUNTAIN DISTRICT, Masonic Bldg., Denver Col.
SOUTHERN DISTRICT, Gould Bldg., 10 Decatur St., Atlanta, Ga.

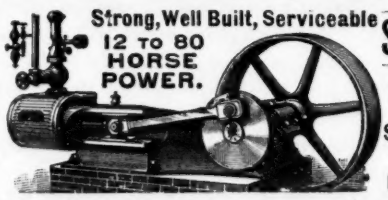


PORTBLE, HAND OR BELT PIPE CUTTING & THREADING MACHINE.

Double Application of Power. Double Leader Screw Instantly Changeable, range from 1 to 6 in. Pipe.

Write for Description and Prices

WELLS MACHINE WORKS, FOSTORIA, O.



Strong, Well Built, Serviceable 12 TO 80 HORSE POWER.

STEAM ENGINES

ADAPTED TO HEAVY, CONTINUOUS WORK.

EVERY ENGINE TESTED UNDER FULL LOAD.

Suitable BOILERS on hand for immediate delivery

FOR DESCRIPTIVE CIRCULARS ADDRESS

CHANDLER & TAYLOR CO., INDIANAPOLIS, IND.

WANTED.

Good Energetic Solicitors for the

COATES OIL BURNER.

Must be practical in the matter of combustion and steam, and Theories in the building of Furnaces. State References and Territory prefered.

ED. WEINSTEIN, GENERAL MANAGER. COATES OIL BURNER CO. TERRE HAUTE, INDIANA.

AREY'S BOILER SETTING,

THE ONLY SUCCESSFUL SMOKE CONSUMER.

Also Reduces Coal Bills.

C. O. AREY, - - - Rooms 27-28,

8 Euclid Ave., CLEVELAND, OHIO.

Two Books for Foundrymen.

AMERICAN FOUNDRY PRACTICE.

BY THOS. D. WEST.

Treating of Loam, Dry Sand and Green Sand Moulding, and containing a Practical Treatise upon the management of Cupolas and the Melting of Iron.

West's Moulder's Text-Book

Being Part II of American Foundry Practice

Presenting best methods and original rules for obtaining good, sound, clean castings, and giving detailed description for making moulds requiring skill and experience.

Also containing a practical treatise upon the construction of cranes and cupolas, and the melting of iron and scrap steel in iron foundries. Either of the above books will be sent by mail, postage paid, $2.50. Address

The Iron Trade Review Company,

CLEVELAND, O.

Advertising.

IF you wish to advertise anything anywhere at any time write to GEO. P. ROWELL & CO., No. 10 Spruce St., New York.

EVERY one in need of information on the subject of advertising will do well to obtain a copy of "Book for Advertisers," 368 pages, price one dollar. Mailed, postage paid, on receipt of price. Contains a careful compilation from the American Newspaper Directory of all the best papers and class journals; gives the circulation rating of every one, and a good deal of information about rates and other matters pertaining to the business of advertising. Address ROWELL'S ADVERTISING BUREAU, 10 Spruce St., N. Y.

PATENTS

For INVENTORS. 40-page BOOK FREE. Address W.T. Fitzgerald, Att'y at Law, Washington, D.C.

DON'T USE poor printing when you can get the best at the same prices, of the CLEVELAND PRINTING & PUBLISHING CO., Cleveland, O.

SPICER MANUFACTURING CO.,

New Philadelphia, O.

General Foundry and Machine Work, Heavy and Light Castings.

Privilege to make estimates solicited.

GRANULATED RAW BONE

For Case Hardening and Coloring

For samples, prices, etc., apply to

THE ROGERS & HUBBARD CO., Middletown, Ct.

Keep a Record of Your Insurance

By ordering one of our Improved

Expiration Registers.

Blanks for all the essential points of each policy.

ONLY 50 CENTS (Postage paid).

Will last for years. Sample leaves sent on application. Address

The Cleveland Printing & Publishing Co.

27, 29 and 31 Vincent Street,

CLEVELAND, O

Plate Iron Washers

A SPECIALTY!

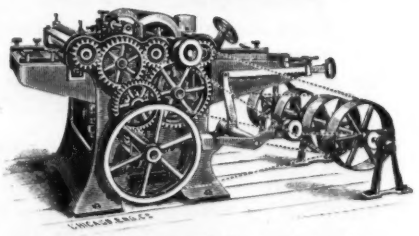
Even in Gauge, smooth and well finished.

Cut from new plate, rolled expressly for the purpose. Write for prices, Address,

MILTON MFG. CO., Milton, Pa.

Wood - Working Machinery

OF EVERY DESCRIPTION.



No. 2 Clipper Planer, Matcher and Moulder.

When in want of an A 1 Planer and Matcher, Surfacer, Hand Planer, Shaper, Moulder, Mortiser, Tenoner, Band Saw, Scroll Saw, Gang Edger, Rip Saw, Cross Cut or Swing Saw, in fact any Wood-Working Machinery, write for our special prices and catalogue.

INDIANA MACHINE WORKS,

FORT WAYNE, IND.

PERFORATED METALS OF EVERY DESCRIPTION BY THE HARRINGTON & KING PERFORATING CO. CHICAGO.
284 Pearl St., cor. Beekman. NEW YORK.

IRON AND STEEL MARKETS.

PIG IRON.

CLEVELAND (f. o. b. cars, net cash) Bessemer, $17 30; No. 1 Foundry, $16 80; No. 2 Foundry, $15 80; No. 1 Gray Forge, red short, $14 80; No. 2 Gray Forge, neutral, $14 30; No. 1 American Scotch, $16 80; No. 2 American Scotch, $15 80.

CHICAGO (reported by Messrs. Rogers, Brown & Merwin): Southern Coke No. 1. foundry, $16 25@17 00; Southern Coke No. 2 Foundry, $15 25@16 00; Southern Coke No. 3 Foundry, $14 75@15 50; Southern Coke No 1, Softeners, $15 25@16 00; Southern Coke No. 2, Softeners, $14 50@15 25; Ohio Silveries No. 1, $17 50@18 50; Ohio Silveries No. 2, $16 50@ 17 50; Ohio Strong Softeners No. 1, $18 00@19 00; Ohio Strong Softeners No. 2, $17 25@18 25; Lake Superior Charcoal Nos. 1 to 6, $17 75@18 50; Tennessee Charcoal No. 1, $18 00@18 00; Tennessee Charcoal No. 2, $17 00@18 00; Southern Standard Car Wheel, $21 00@23 00; Tennessee Standard Car Wheel, $00 00@00 00.

CINCINNATI (reported by Rogers, Brown & Co.): FOUNDRY IRONS—Southern Coke, No. 1 foundry, $14 75@15 25; Southern coke, No. 2 and No. 1 soft, $13 75@$14 00; Hanging Rock Coke, No. 1 foundry, $16 50@17 50; Jackson Co. Stone Coal, No. 1 foundry, $16 50@17 00; Tennessee Charcoal, No. 1 foundry, $16 50@17 50; Hanging Rock Charcoal, No. 1 foundry, $20 00@22 00. MILL IRONS—Standard Southern Coke, grey forge, $12 50@12 75; Standard Southern Coke, mottled, $12 25@12 50; Cold Short Southern Coke, grey forge, $12 75@13 00; Strong Ohio Neutral Coke, grey forge, $15 00@15 50. CAR WHEEL AND MALLEABLE—Standard Alabama Car Wheel, $19 50@20 50; Tennessee Car Wheel, $18 00@19 00; Lake Superior Car Wheel, $19 50@20 50.

BUFFALO (reported by Rogers, Brown & Co.): Mahoning and Shenango Valley strong, No. 1 Foundry, $16 50@00 00; Mahoning and Shenango Valley strong, No. 2 Foundry, $15 50@00 00; Ohio Softener No. 1, $16 50@00 00; Ohio Softener No. 2, $15 50@00 00; Jackson Co., Silvery No. 1, $18 00@00 00; Jackson Co. Silvery, No. 2, $17 00@00 00; Lake Superior Charcoal, $18 50@00 00; Tennessee Charcoal, $17 50@19 00; Southern Softener No. 1, $16 00@00 00; Southern Softener No. 2, $15 25@00 00; Southern Strong No. 1 Foundry, $16 75@00 00; Southern Strong No. 2 Foundry, $16 00@00 00' Alabama Car Wheel, $22 00@22 50; Hanging Rock Char coal, $23 00@24 00.

LOUISVILLE (reported by Hall Bros. & Co.) HOT BLAST FOUNDRY—Southern coke No. 1, $14 25@14 50; Southern coke No. 2, $13 50@14 00; Southern coke No. 3, $13 00@13 25; Mahoning Valley (Lake ore mixtures), $00 00@00 00; Southern charcoal, No. 1, $16 00@17 00; Southern charcoal, No. 2, $15 50@16 00; Missouri charcoal, No. 1, $17 00@17 50; Missouri charcoal, No. 2, $16 50@17 00. FORGE—Neutral coke, $12 50@12 75; Cold short, $12 25@12 50; Mottled, $11 75@12 00. CAR WHEEL AND MALLEABLE—Southern (standard brands), $19 00@19 50; Southern (other brands), $17 00@18 00; Lake Superior, $20 00@21 00.

ST. LOUIS (reported by Rogers, Brown & Meacham): HOT BLAST COKE AND CHARCOAL—Southern Coke No. 1, $15 50@15 75; Southern Coke No. 2, $14 50@14 75; Southern Coke No. 3, $13 75@14 00; Southern Grey Forge, $13 25@13 50; Southern Charcoal No. 1, $17 25@17 75; Southern Charcoal No. 2, $16 75@1 25; Missouri Charcoal No. 1, $15 50@16 00; Missouri Charcoal No. 2, $15 00@15 50; Ohio Softeners, $18 00@19 00. CAR WHEEL AND MALLEABLE IRONS—Lake Superior, $19 50@20 00; Southern, $19 50@20 00. CONNELLSVILLE COKE—East St. Louis, $0 00; St. Louis, $5 65.

DETROIT (reported by William F. Jarvis & Co.): Lake Superior Charcoal, all Numbers, $18 00@18 50; Lake Superior (coke) Bessemer, $17 75@18 50; Katahdin (Maine charcoal), $00 00@00 00; Lake Superior Coke, Foundry, all ore, $17 50@18 00; Lake Superior Coke, Foundry, all ore, $00 00@00 00; Standard Ohio Black Band, $18 00@18 50; Southern No. 1 $16 25@16 50; Southern Gray Forge, $14 00@14 50; Jackson County (Ohio) Silvery, $18 25@18 75; Old Car Wheel, $00 00@00 00. Connellsville Coke, $0.00.

LOUISVILLE (reported by Geo. H. Hull & Co.: Southern Coke No. 1 Foundry $14 50@15 00; Southern Coke No. 2 Foundry $13 75@14 25; Southern Coke No. 3 Foundry $13 25@13 75; Grey Forge, $12 75@13 25; Southern Coke Silver Grey, $00 00@00 00; Southern Charcoal No. 1 Foundry, $16 00@17 00; Car Wheel, $18 50@20 00.

PITTSBURGH (reported by A. H. Childs): No. 1 Foundry, $16 00@16 25; No. 2 Foundry, $15 00@15 25; Grey Forge, $13 75@14 00; White and Mottled, $13 25@13 50; Warm Blast Charcoal, $18 00@20 00; Cold Blast Charcoal, $22 00@27 00; Bessemer, $15 50@16 00.

MERCHANT IRON AND STEEL.

Flat Bar

1½ to 4 by ⅛ to 1 inch	1 80
4½ to 6 by ⅛ to 1 inch	1 90
1½ to 6 by 1⅛ to 2 inch	2 20
1½ & 1¾ by ⅛ to ¼ inch	1 90
1 & 1¼ by ⅛ to ¼ inch	2 00
⅛, ¼ and ⅜ by ⅛ to ½ inch	2 20

Round and Square.

1 to 1⅞ inch	1 80
2 to 2¼ inch	2 00
2⅜ to 3¼ inch	2 30
3⅜ to 4 inch	2 80
4⅛ to 4⅞ inch	3 30
4⅞ to 5 inch	3 50

Oval.

¼ to 1¼ inch	2 20
⅜ to ¼ inch	2 40
⅜	2 60
½	3 00

Half Oval and Half Round.

¼ to 3 inch	2 90
⅜ to 1¼ inch	2 50
⅜ to ¾ inch	3 10
½	3 30
⅝	4 80

Heavy Band.

¼ to 6 by ¼ and 5-16 inch	2 00
¼ to 1⅜ by ¼ and 5-16 inch	2 10
⅜ to ½ by ¼ and 5-16 inch	2 30
⅜ to ½ by ½ and 5-16 inch	3 80

Hoops.

1¼ to 4, Nos. 13 to 15	2 60
1¼ to 2, Nos. 16 to 18	2 70
1¼ to 2, No. 19	2 80
1¼ to 2, No. 20	2 90
1¼ to 2, No. 21	3 00
1¼ to 2, No. 22	3 10
15-16, 1 and 1⅛, Nos. 13 to 15	2 80
15-16, 1 and 1⅛, Nos. 16 to 18	2 90
15-16, 1 and 1⅛, Nos. 19 and 20	3 00
15-16, 1 and 1⅛, No. 21	3 10
15-16, 1 and 1⅛, No. 22	3 20
⅞, Nos. 13 to 15	3 00
⅞, Nos. 16 to 18	3 10
⅞, Nos. 19 and 20	3 20
⅞, No. 21	3 30
⅞, No. 22	3 40
13-16, Nos. 13 to 15	3 20
13-16, Nos. 16 to 18	3 30
13-16, Nos. 19 and 20	3 40
13-16, No. 21	3 50
13-16, No. 22	3 60
¾, Nos. 13 to 15	3 30
¾, Nos. 16 to 18	3 50
¾, Nos. 19 and 20	3 60
¾, No. 21	3 70
¾, No. 22	3 80
11-16, Nos. 13 to 15	3 50
11-16, Nos. 16 to 18	3 70
11-16, Nos. 19 and 20	3 80
11-16, No. 21	3 90
11-16, No. 22	4 00
⅝, Nos. 13 to 15	3 80
⅝, Nos. 16 to 18	4 00
⅝, Nos. 19 and 20	4 10
⅝, No. 21	4 20
⅝, No. 22	4 30
⅝, No. 23	4 50

Light Band.

1⅛ to 6 by ⅛ to 3-16 in	2 20
1⅛ to 6 by Nos. 11 and 12	2 30
1 to 1⅜ by ⅛ to 3-16 in	2 40
1 to 1⅜ by Nos. 11 and 12	2 50
⅞ and 13-16 by ⅛ to 3-16 in	2 70
⅞ and 1 3-16 by Nos. 11 and 12	2 80
¾ and 11-16 by ⅛ to 3-16 in	3 00
¾ and 11-16 by Nos. 11 and 12	3 10
⅝ and 9-16 by ⅛ to 3-16 in.	3 30
⅝ and 9-16 by Nos. 11 and 12	3 40
½ by ⅛ to 3-16 in	3 60
½ by Nos. 11 and 12	3 70

Wagon Box Iron.

⅜ inch, beveled edge, by Nos. 11 and 12	2 80
⅜ inch, " " " 13 and 14	3 00
⅜ inch, " " " 11 and 12	3 10
⅜ inch, " " " 13 and 14	3 30

Sheet Iron:

No. 10 to 14	2 65
No. 15 to 17	2 75
No. 18 to 21	2 99
No. 22 to 24	3 15
No. 25 to 26	3 30
No. 27	3 40
No. 28	3 50

Iron Boiler Plates.

Tank, ¼ inch and heavier	2 60
C No. 1, " "	2 85
C H No. 1 " "	3 10
C H Flange, "	3 85
Extra Flange, "	4 35
Solid Fire Box "	5 10

Steel Boiler Plates—1-4 in. and Heavier.

Tank	2 75
Shell	3 15
Flange	3 45
Marine Flange	3 85
Fire Box	4 55

Above includes plates 90 inches wide.

90 to 96 in. wide	¼c ℔ extra
96 to 100 in. wide	1 c "
100 to 104 in. wide	1½c "
104 to 116 in. wide	special

American Cast Tool Steel.

ROUND, SQUARE AND OCTAGON.	cts. ℔s
1 to 2 in. inclusive	09
9-16 to ⅞ in "	09
7-16 to ⅝ and 2⅜ to 3 in	10⅜
3⅛ to 4 in	11
⅜ to 11-16 and 4⅛	10⅜
⅛ to 6 in	11⅜
¼ to 9-32 and 6⅛ to 7 in	12
3-6 in	14

Flats.

	cts. ℔s
2 to 9-16 wide by 2 to ⅝ thick	9

Bessemer and O. H. Steel.

Machinery	base price, 2 75
Tire	" 2 75
Spring	" 3 25
Sleigh Shoe	" 2 75
Toe Calk	" 3 00
Cutter Shoes, tapered and burr.	" 3 00

English Tool Steel.

Jessop's	16c
Hobson's "Best"	16c
" "Choice"	16c

Burden Boiler Rivets.

⅜, ½, 11-16 and ¾ inches diameter	4 00
Bridge ⅜, ½, 11-16 and ¾ inch diam	4 00

SCRAP IRON AND OLD METAL.

	NET TONS
No. 1 R. R. wrought scrap	$18 00
No. 1 wrought scrap	16 50
No. 1 Machine cast scrap	11 50
Iron axles	23 50
Axle turnings	13 50
Wrought turning (free from cast)	11 50
Cast borings	8 00
Uncut wrought iron boilers	11 50
Steel boiler plates	16 00
Grate Bars	8 00
Pipes and flues (Clean)	12 00
Tank iron	12 50
Hoop and band iron	9 50
Sheet iron	8 50
Wrought drillings	11 00
Malleable iron	9 50

Reported by Messrs. BLACK & POLLOCK, Cincinnati, O.:

Railroad Wrought	$20 00
No. 1 Country Wrought	17 00
Stove Plate	8 75
Machine Castings	11 00
Hoop and Sheet	8 00
Casting Borings	9 00
Wrought Turnings	00 00

THE CAMBRIDGE IRON & STEEL CO.
MANUFACTURERS OF
SHEET IRON AND SHEET STEEL
CAMBRIDGE REFINED IRON. TRADE MARK
Squared Roofing Sheets a Specialty
CAPACITY RANGES FROM No 30 26 INCHES WIDE TO 1-4×40×120
CAMBRIDGE SOFT STEEL. TRADE MARK
CORRESPONDENCE SOLICITED
OFFICE AND WORKS CAMBRIDGE, OHIO.

CLEVELAND ROLLING MILL CO.,
MANUFACTURERS OF
BESSEMER STEEL RAILS,
Blooms and Billets, Steel Angles, Forgings, Bar and Spring Steel. Steel Street Rails, Steel Oil Barrel Hoops, Wire of all Kinds, Iron and Steel Boiler Plates, Galvanised and Black Sheet Iron, Corrugated Iron Roofing, Sheet Steel.

CATALOGUES
Printed in the Highest Style of Art, by
The Cleveland Printing & Publishing Co.,
Cleveland, O.

CORRICAN, IVES & CO.,
DEALERS IN
Iron Ore & Pig Iron,
Rooms 716. 717. 718, 719 Perry-Payne Bld'g,
CLEVELAND, O.

OGLEBAY, NORTON & CO.,
Successors to Tuttle, Oglebay & Co.,
Commission Dealers in
Iron - Ores,
FROM MARQUETTE, GOGEBIC AND MENOMINEE DISTRICTS,
CLEVELAND, OHIO.

J. H. OUTHWAITE. W. G. POLLOCK.
J. H. OUTHWAITE & CO.,
Exclusive attention given to
LAKE SUPERIOR AND MENOMINEE RANGE
Iron Ore,
Perry-Payne B'ld'g. Cleveland, O.

THE CONDIT-FULLER CO.,
Pig and Bar Iron,
CLEVELAND. OHIO.

E. C. POPE,
COMMISSION DEALER IN
Iron Ore, Pig Iron
AND METALS.
Cleveland, - Ohio.

Sam'l. L. Matnei, Prest. & Treas. Fred. A. Morse, Sec'y.
Cleveland Iron Mining Co.,
Dealers in Iron Ores
from their own mines near Marquette, Lake Superior.
Rooms 4 & 5 Mercantile Bank Building,
CLEVELAND O.

PITTSBURGH & WHEELING COAL CO.,
MINERS AND SHIPPERS OF
Ohio Steam Coal and Coke.
Mines on the Cleveland, Lorain & Wheeling R. R. Capacity, 3,000 tons daily.
Office, 6 Mercantile Bank Building,
CLEVELAND, OHIO.
Lake Shipping Point, Lorain O.
JAS. PATTERSON, Sales Agent.

ESTABLISHED 1854.
PETER GERLACH & CO.,
MAKERS OF
Saws, Tools and Machinery.
Office and Warerooms, 28 Columbus st. Factories on Columbus, Winter and Leonard streets.
Cleveland, O., U. S. A.

DESKS.

BANK, RAILROAD
—AND—
OFFICE FURNITURE.
Interior Work a Specialty.
Send for Illustrated Catalogue.
THE CLEVELAND DESK CO.
97-99 Ontario St.. Cleveland, Ohio.

MACHINERY SUPPLY MARKET.

Anvils.

American.....₩ lb 9@10
Wrights.....₩ lb 12

Bellows.

Blacksmiths' { Hill's.....dis 40 / Bullock's.... dis 50&10
Moulders'.....dis 40@40&10
Hand.....dis 40&10@50

Belting.

Boston Belting Co's standard.....dis 70
" " " extra.....dis 60&5
" " " best.....dis 55
Hoyt's Short Lap.....dis 45
Cleveland Rubber Co. extra standard..dis 60&10
Shults Raw Hide Leather Belting, single.....dis 40
Shults Raw Hide Leather Belting, double, and Light Double.....dis 40
Standard, oak tanned.....dis 50&10
Alexander Brothers' pure oak tanned. ...dis 45

Blowers and Exhausters.

B. F. Sturtevant's.....dis 20
Boston Blower Co.,.....dis 35
Buffalo.....dis 35

Borax.

.....₩ lb 12

Chalk.

White.....₩ gross 50
White Crayon.....₩ gross 12@12½ dis 10
Red.....dis 70
Blue.....dis 85

Chucks.

Cushman's 4 Jaw Independent.....dis 45
" Combination.....dis 40
" Geared Scroll.....dis 30
" 2 Jaw Brass Workers.....dis 30
" Drill.....dis 35
Wescott's Scroll Combination.....dis 33⅓
" Independent.....dis 40
" Little Giant Drill.....dis 30
Horton's Universal.....dis 40
" Independent.....dis 45
Whiton's Independent.....dis 45
National Combination.....dis 40
Sweetland " .....dis 40
Almond Drill.....dis 20
Morse " .....dis 15
Skinner's Combination Lathe.....dis 33⅓
" Independent Lathe.....dis 40
" Universal Lathe.....dis 40
" Drill.....dis 15

Cutters and Reamers.

Cleveland.....dis 10@15
Pratt & Whitney.....dis 10@15
Standard.....dis 10@15
Brown & Sharpe, Milling Cutters.....dis 15
Gear Cutters.....dis 15

Crowbars.

Cast Steel.....₩ lb 4
Iron, steel points.....₩ lb 3½

Drill and Drill Sockets.

Twist drills.....dis 50&10
Morse Taper and Straight shank to 1⅜".....dis 50&10
Morse Taper and Straight shank Larger than 1⅜".....dis 25
Drill Sockets.....dis 25
Standard Twist Drills.....dis 55@55&5
Cleveland " .....dis 55@55&5

Emery.

	No. 4 to 46 gr.	No. 54 to 150. gr.	Flour, F.	C. F. FF.
Kegs, ₩ lb	4 c	5 c		2½c
½ kegs ₩ lb	4½c	5½c		2¾c
¼ kegs ₩ lb	4¾c	5¾c		3 c
10 lb cans, 10 in case	6 c	6½c		5 c
6 lb cans, less than 1	10 c	10 c		7½c

Emery Cloth and Paper.

Barder, Adamson & Co.....dis 45@50
H. H. Barton.....dis 50@50&10

Emery Wheels.

Detroit.....dis 55@60
Norton's.....dis 55@60
Grant.....dis 55@60
Sterling.....dis 60
Celluloid.....dis 10&33⅓
Northampton.....dis 55
Crystal.....dis 65@70
Vitrified.....dis 60
Vulcanite.....dis 10&10

Files.

Nicholson.....dis 60&10@60&10&10
" X. F.....dis 25
Kearney & Foot.....dis 60&10@60&10&10
Black Diamond.....dis 60&10@60&10&10
Arcade.....dis 60&10@60&10&10
Disston's.....dis 65@70
Western.....dis 70
Stub's.....dis 25
Grobet's.....dis 50
Reynolds Bros.' Hand Cut.....dis 50
ndustry File Works, hand cut.....dis 50

Hammers.

P. S. W.....dis 40
Atha new list, Jan. 15, 1887.....dis 50
Heavy hammers and sledges under 5 lbs. 18c over 5 lbs 14c, new list.

Jack Screws.

Illinois Bolt Co. list.....dis 70

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4½	4	3½	2½
Hexagon	15¾	11½	8½	6	5½	5	5
Washers	9	8	7	5	4½	4½	4½

In lots less than 100 lbs, ₩ lb add ½c., 1 lb boxes add 1c to list.

Nails (wire.

List July 14, 1887.....dis 70 &10
Standard Penny Nails, ₩ keg card rate { Car lots.....$2.30 / Less than car lots $2.40

Oilers.

Zinc and Tin.....dis 60
Brass and Copper.....dis 50
Malleable (Hammer's), No. 1, $3.50; No. 2, $4.00; No. 3, $4.40 ₩ doz.....dis 10@10&10

Packing, Steam.

Boston Belting Co.....dis 60
American Packing Hemp.....₩ lb 10@11
Russia Packing " .....₩ lb 14
Italian Packing " .....₩ lb 12@14
Plumbago Piston.....₩ lb 40
Morrison's " .....₩ lb 50
Square Flax " .....₩ lb 50
Sheet Rubber.....₩ lb 12&24
Excelsior Rubber.....₩ lb 48

Picks.

Railroads, 5 to 6 lbs.....$12 dis 60
" 6 to 7 lbs.....$13 dis 60

Pulleys.

Iron Pulleys, Walker List.....dis 45
Medart Pulleys.....dis 55
Split Wood Pulleys.....dis 50@55

Rivets.

Iron, Thousand, list November 17, ...dis 50
Iron, Ordinary, Cooper's Block and Carriage list November 17.....dis 50
Copper.....dis 50@50&10

Rope.

Manilla, ½ inch and over.....₩ lb 15½
Sisal, ½ inch and over.....₩ lb 13½

Sand Paper.

B. A. & Co.....dis 45@50
H. H. Barton's.....dis 40@45
New England Flint.....dis 40@50
Barton's Garnet.....dis 20

Saws.

Disston's Circular.....dis 40@10
" Band.....dis 20
" Scroll.....Net
Hack Saw Stubs.....dis 20
" " Eureka.....dis 20
" " Star.....dis 20
Saw Swages Disston's.....dis 30
Atkins' Cicular Saws.....dis 40&45
" Mill, Mulay and Drag Saws..dis 40&10
" Wood Saws.....dis 40&10
" Silver Steel Diamond Cross-cut Saws.....dis 70c per ft
" Dexter Cross-cuts.....dis 50c "
" Diamond " .....dis 30c "
" Tuttle Tooth Cross-cuts..dis 25c "
" One-man Cross-cuts.....dis 33c "
No. 1 Handles.....dis 23c per pair
No. 6 " .....dis 16c "
Excelsior Saw Tools.....$6 per doz
Perfection " .....$15 "
Detroit Saw Works, Circular.....dis 50
" " " Band.....dis 25
" " " Mulay.....dis 45

Screws.

Wood Screws—New List 1890.

Flat head iron.....dis 72½
Round head iron.....dis 67½
Flat head brass.....dis 72½
Round head brass.....dis 65
Square Cap.....dis 65
Hexagon Cap.....dis 60
Set C. H. C. P.....dis 70
Machine, flat head, iron.....dis 65
Machine, round head, iron.....dis 60
Bench and hand—
Lag or coach.....dis 75@75&10
Coach, patent gimlet point.....dis 75

Shovels and Spades.

Ames' list November 1, 1885.....dis 20
Dennis.....dis 5.25
Hussey & Binns, railroad.....dis 8.00

Taps.

Cards, Hand and Nut to 2 in.....dis 50
Carpenters' " " " .....dis 50
Morse " " " .....dis 50
Pratt & Whitney " " new list dis 10
Machine Screw Taps.....dis 55
Pipe Taps to 2½ in.....dis 70
Stay Bolt Taps.....dis 25
Stove Bolt Taps.....dis 50
Pulley Taps.....dis 40

Twine.

	BC.	B.
No. 12, Flax Twine, ¼ and ⅛ lb Balls		21c@29c
No. 18 " " ¼ and ⅛ "		18c@28c
No. 36 " " ¼ and ⅛ "		16c@27c
2-Ply Hemp, ¼ & ⅛ lb Balls (Spring Twine		11¼c
3-Ply " 1 lb Balls		12@12¼c
3-Ply " 1½ lb Balls		11@11¼c
Cotton Wrapping, 5 Balls to lb		15@16c

Vises.

Solid Box.....dis 60
Parker's.....dis 20@25
Prentiss.....dis 20
Stephen's.....dis 25@30
Barrett's.....dis 30
Miller's Falls.....dis 40
Merrill's.....dis 15@20
Howard.....dis 25

Wire.

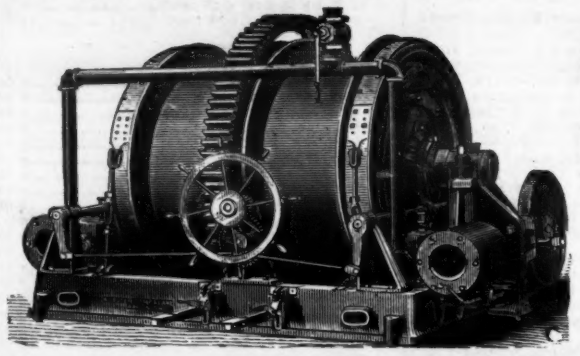
New List, Jan. 18, 1884

Brass and copper.....dis 20@25
Bright and annealed, Nos. 0@18...dis 70&10@75
" " Nos. 19@26..dis 75@75& 5
" " Nos. 27@36..dis 75&10& 5
Coppered Nos. 0 to 18, market list..dis 70@70& 5
Galvanized Nos. 0 to 18 " " .....dis 65&5
Tinned market Nos. 0 to 18.....dis 67½
Cast steel.....dis 50
Tinned Broom Wire.....dis 70&5@70&10
Annealed Fence, Nos. 8 and 9.....dis 75
Annealed Grape, Nos. 10 to 14.....dis 75
Stub's Steel Wire, regular.....$6.00@lb dis 3

Wrenches.

Coe's genuine, ...dis 50
Girard Standard.....dis 70&10
Agricultural.....dis 75&10
Mechanics'.....dis 55&10,& 3
Bemis & Call's Combination .....dis 25
Donohue's Engineers.....dis 20&10
Lamson & Sessions Engineers.....dis 60
Billings & Spencer's Drop Forged.....dis 25
William's " " .....dis 25
Alligator " " .....dis 50

Webster, Camp & Lane Machine Co.



MANUFACTURERS OF

Mining Machinery,

Improved Band Friction Hoisting Machinery, Geared or Direct Acting, for round or flat rope.

Wire Rope Haulage Machinery,

Endless or Tail Rope Systems.)

CORNISH PLUNGER AND BUCKET LIFT PUMPS.

Automatic or Slide Valve Steam Engines, Sheaves. Cages, Buckets. Etc.

Send for Catalogue D. 134 N. Main St., AKRON, OHIO.

TIME IS MONEY!

SAVE TIME AND MONEY BY USING OUR SPECIALTIES.

OUR **Time Stamps** A M

Mark the hour and minute, the day, month and year, by one impression.

Useful, Economical, Ornamental.

PRINTED MATTER ON APPLICATION.

OUR **Time Registers**

Record the hour and minute of the arrival and departure of employes by their own act, in their own handwriting.

Indispensable for employers and just to employes.

THE AUTOMATIC TIME STAMP AND REGISTER COMPANY

No. 71 Sudbury St., Boston, Mass., U. S. A.

THE THOS. D. WEST FOUNDRY, CO.

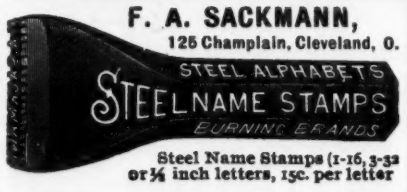
CLEVELAND, O.

LIGHT AND HEAVY

IRON CASTINGS.

DAILY MELTING CAPACITY 75 TONS-SPECIAL FACILITIES FOR ECONOMICALY TURNING OUT SMOOTH CLEAN CASTINGS.

DUPLICATE WORK A SPECIALTY.



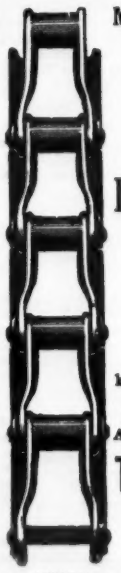
F. A. SACKMANN,

125 Champlain, Cleveland, O.

Steel Name Stamps (1-16, 3-32 or ¼ inch letters, 15c. per letter

SECTION OF CONVEYOR.

Detachable Roller and Chain Belting,



MADE IN ALL SIZES OF

Malleable Iron and Steel,

DESIGNED FOR

Elevators, Conveyors, Drive Belts, etc.

For handling materials of all kinds.

Send for Illustrated Catalogue. Address

The Jeffrey M'f'g Co.,

183 East 1st Ave.,

COLUMBUS, O.

CHAIN

Chicago Office, 48 S. Canal St.

Eastlake Metallic Shingles.

Unequaled for ROOFING AND SIDING.

Manufactured by W. J. BURTON & CO.'s Galvanized Iron Cornice Works, Detroit, Mich.

Send for illustrated catalogue and prices.

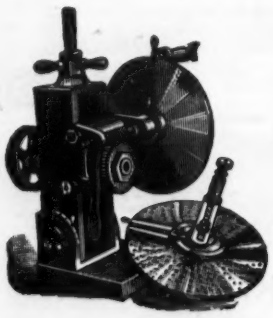
Mention this paper.

UNION ELECTROTYPE FOUNDRY

TELEPHONE 2129

829 SHERIFF ST. CLEVELAND O.

Palmer's Gear Cutting Attachment



CAN BE USED ON ANY SCREW-CUTTING LATHE FOR

Amateurs, Clock Makers, Model Makers, Knitting Machine Makers, Tool Makers,

Or any one having use for SMALL GEARING.

For particulars, address

PALMER, CUNNINGHAM & CO., L't'd,

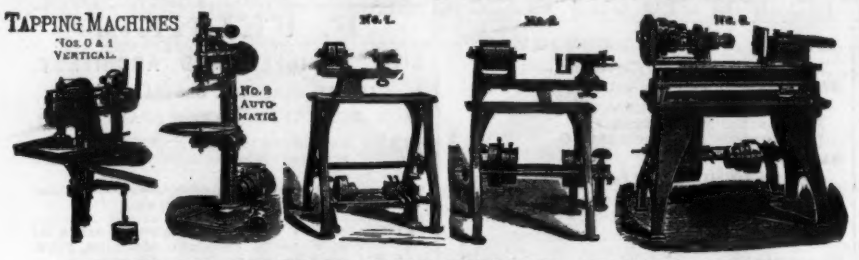
607 Market St., PHILADELPHIA, PA.

IRON FOUNDRY CANTON IRON FOUNDRY CO., Canton, Ohio.

HEAVY AND LIGHT CASTINGS.

Privilege to make estimates solicited.

OUR LINE OF TAPPING MACHINES.



THE GARVIN MACHINE COMPANY,

Manufacturers of, and Dealers in, all kinds of

MACHINERY AND MACHINE TOOLS.

Universal and Plain Milling Machines, Drill Presses, Screw Machines, Hand and Engine Lathes, Planers, Profilers, Chucking Machines,

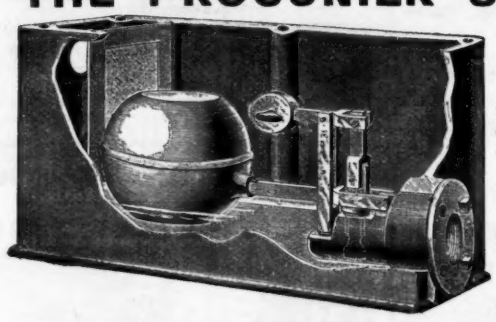
Gear Cutters, Die and Cutter Grinders, Tapping Machines, Wire-Spring Coilers, Milling Cutters, &c.

Plants for Manufacturers of Sewing Machines & Electrical Goods.

GEAR-CUTTING AND MILLING IN ALL ITS BRANCHES.

Laight & Canal Sts. [Catalogue sent on Application.] **NEW YORK.**

THE PROCUNIER STEAM TRAP ON TOP.



The only STEAM TRAP made that opens mechanically and drains itself when steam is shut off.

Sent on Thirty Days Trial.

SPAULDING & METCALF,

63 S. Canal St., Chicago, Ill.

51 N. Seventh St., Philadelphia, Pa.

PORTABLE BOILERS.

We have for sale one **20 H. P.** and one **25 H. P.** Portable Boilers of the Oil Country Type. These Boilers are made from the very best material, are entirely new, and have been tested to 160 lbs. pressure. Smoke Stacks and Fittings, complete, will be furnished if desired.

Twenty Horse Power:

Diameter of Shell	36 in.
Diameter of Tubes	3 in.
Length of Tubes	8 ft.
Number of Tubes	36
Fire Box, Height	36 in.
Width	36 in.
Length	48 in.
Dome, Diameter	28 in.
Height	34 in.

Twenty Five Horse Power:

Diameter of Shell	38 in.
Diameter of Tubes	3 in.
Length of Tubes	8 ft.
Numbes of Tubes	42
Smoke Box	18 in.
Fire Box Height	39 in.
Width	38 in.
Length	52 in.
Dome, Diameter	30 in.
Height	34 in.

For Description and Prices Apply to

BASSETT, PRESLEY AND TRAIN, Cor. Elm and Hemlock Sts., **CLEVELAND, O.**

WHAT'S THAT?

For good quality and bottom prices order your **FACINGS, FIRE-BRICK, CLAY,**

FOUNDRY SUPPLIES,

MOULDING SAND and everything for a foundry, of

That's What! **F. B. STEVENS,**

DETROIT, MICH.

CLEVELAND OFFICE

— OF THE —

LODGE & DAVIS MACHINE TOOL CO.

IS AT

173 Superior Street and 237 Bank Street,

TELEPHONE 910.

M. P. SATTERTHWAITE, Manager.

Please mention this paper.

S. T. W. Ejector.

For Raising Water from Deep Wells, Streams, Excavations, &c.

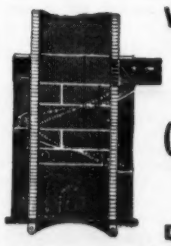
The cheapest made. Send for prices.

JAMES JENKS,

Manufacturer,

DETROIT, MICH.

M. P. SATTERTHWAITE, Agt., Cleveland, O.



VICTOR COLLIAU,

Sole Manufacturer of the

Improved Patent HOT BLAST

COLLIAU CUPOLA

ADDRESS:

287 Jefferson Ave..

DETROIT, - MICH.

FREIGHT AND PASSENGER

ELEVATORS.

L. S. GRAVES & SON,

Main Office and Works, ROCHESTER, N. Y.

BRANCH OFFICES:

NEW YORK, 92 and 94 Liberty St.; BOSTON, 113 Devonshire St.; St. LOUIS, 301 Roe Buildin DETROIT, Hodges Building.

SEND FOR CATALOGUE.

RUBBER GOODS

PACKING, BELTING, HOSE, GASKETS, ETC.

Fuller Bros.,

AGENTS

JEWELL LEATHER BELT, and REVERE RUBBER CO.

148 SUPERIOR STREET, CLEVELAND.

OFFICE 510---265 to 269 DEARBORN ST.

WORKS AT SOUTH CHICAGO.

DIXON'S GRAPHITE PAINT

THOSE who use it say that one pound will cover 2 to 3 times more surface and last 4 to 5 times longer than any lead, mineral or metallic paint. A tin or iron roof well painted will not require repainting for 10 to 15 years.

JOS. DIXON CRUCIBLE CO.,

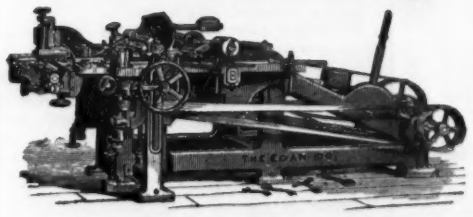
Jersey City, N. J.

THE ECAN CO.,

Nos. 251 to 271 W. Front St., CINCINNATI, OHIO.

Builders and Originators, Designers and Constructors.

Wood-Working Machinery.



New "Standard Molder, Four Sided.

4, 6, 7, 8, 9, 10 and 12-inch.

Geared feed rolls, two above and two in table. Slotted steel heads.

For Every Purpose

Meeting the requirements of

PLANING MILLS,

SASH, DOOR and BLIND FACTORIES,

PATTERN SHOPS,

General Wood-workers etc

With the latest and most advanced type of machines for fast and perfect work.

Send for Catalogue and information.

AKRON CHEMICAL CO.,

Imperial Car and Bridge Paints. **PAINTS.** Black Asphaltum Paints. All grades.

150 State Street, AKRON, O.

BUYERS' DIRECTORY OF IRON AND STEEL TRADES.

Automatic Sprinklers—
Neracher Sprinkler Co., Warren, O.
Advertising Agencies—
G. P. Rowell, New York.
Belting—
Fuller Bros., Cleveland.
Bolts and Bolt Machinery—
Upson Nut Co., Cleveland.
Boilers and Boiler Attachments—
Babcock & Wilcox Co., New York.
Wm. B. Pollock & Co., Youngstown, O.
E. H. Jones & Co., Cleveland.
Hazelton Tripod Boiler Co., Chicago.
Enterprise Boiler Co., Youngstown, O.
The Stirling Co., Barberton, O.
Chandler & Taylor Co., Indianapolis, Ind.
Skinner Engine Co., Erie, Pa.
Southwark Foundry & Machine Co., Philadelphia, Pa.
Leffel Water Wheel & Engine Co, Springfield, O.
James Leffel & Co., Springfield, O.
Bassett, Presley & Train, Cleveland.
Blowers—
LaFountaine Mfg. Co., Cleveland, O.
E. H. Jones & Co., Cleveland.
Boiler Solvents—
Dearborn Drug & Chemical Co., Chicago, Ill
Blowing Engines—
The James Leffel & Co., Springfield, O.
Southwark Foundry & Machine Co., Philadelphia, Pa
Coal and Coke—
Pittsburgh & Wheeling Coal Co., Cleveland.
Cranes and Derricks—
Wm. Tod & Co., Youngstown, O.
Southwark Foundry & Machine Co., Philadelphia, Pa.
Chain Belting—
Jeffrey Mfg. Co., Columbus O.
Carpet Cleaning & Laundry Machines—
LaFountaine Mfg. Co., Cleveland, O.
Civil Engineers and Architects—
F. Felkel, Cleveland, O.
Cupolas—
Victor Colliau, Detroit, Mich.
Corrugated Steel—
Cincinnati Corrugating Co., Piqua, O,
Drilling Machines—
Universal Radial Drill Co., Cincinnati, O.
Drop Presses—
Toledo Tool & Machine Co., Toledo, O.
Desks—
Cleveland Desk Co., Cleveland.
Elevators—
L. S. Graves & Co., Rochester, N. Y.
Explosives—
Hercules Powder Co., Cleveland.
Electrical Manufactures—
Cleveland Electrical Mfg. Co., Cleveland.
Central Thomson-Houston Co., Cleveland.
Edison General Electrical Co., N. Y.
Emery Wheel Machinery—
J. Wendell Cole, M. E., Columbus, O., or Chicago, Ill.
Engravers and Electrotypers—
Eclipse Electrotype & Engraving Co., Cleveland.
Union Electrotype Foundry, Cleveland.
Engines (Steam)
Chandler & Taylor Co., Indianapolis, Ind.
Wm Tod & Co., Youngstown, O.
E. H. Jones & Co., Cleveland,
Buckeye Engine Co., Salem, O.
Skinner Engine Co., Erie, Pa.
Westinghouse Machine Co., Pittsburgh.
Ball & Wood Co., Elizabeth, N. J.
Southwark Foundry & Machine Co , Philadelphia, Pa.
Leffel Water Wheel & Engine Co., Springfield, O.
Totten & Hogg, Pittsburgh, Pa.
Webster, Camp, & Lane Machine Co., Akron.
James Leffel & Co., Springfield, O.
Engines (Gas)—
Schleicher, Schumm & Co., Philadelphia, Pa. and Chicago, Ill.
Van Dusen Gas Engine Co., Cincinnati, O.
Engineers and Contractors—
E. H. Jones & Co., Cleveland.
F. Felkel, Cleveland.
Ejectors—
James Jenks, Detroit, Mich.
Engineers' Specialties—
Butman Furnace Co., Chicago, Ill.
Spaulding & Metcalf, Chicago, Ill.
Files, Makers of—
Reynolds Bros., Columbus, O.
A. & H. Gough, Cleveland.
Parkin & Bosworth Co., Cleveland.
Forges—
Cleveland City Forge & Iron Co., Cleveland.
Foundries—
Thos. D. West. Foundry Co., Cleveland.
Canton Iron Foundry Co., Canton, O.
Spicer Mfg. Co., New Philadelphia, O.
For Sale, Wants, etc.—
The James Leffel & Co., Springfield, O.
B. M. Gardner, Cleveland.
Coates Oil Burner Co., Terre Haute, Ind.
Flue Cleaners—
Butman Furnace Co., Chicago, Ill.
Fuel Oil Burners—
Coates Oil Burner Co., Terre Haute, Ind.
Fire Brick Clay—
F. B. Stevens, Detroit, Mich.
Foundry Supplies—
F. B. Stevens, Detroit, Mich.
Gear Cutters—
Palmer, Cunningham & Co., Philadelphia, Pa.
Galvanizers.
H. H. Hodell, Cleveland.
Grapples, Excavators and Dredges—
Jas. H. Lancaster, New York.
Graphite Paint—
Jos. Dixon Crucible Co., Jersey City.
Granulated Raw Bone—
The Rogers & Hubbard Co., Middletown.
Heating Apparatus—
LaFountaine Mfg. Co., Cleveland, O.
Heaters and Purifiers—
Stilwell & Bierce Manufacturing Co., Dayton, O.
E. H. Jones & Co., Cleveland.
Warren Webster & Co., Philadelphia Pa.
Hangers—
LaFountaine Mfg. Co., Cleveland, O.
Hammers (Power)—
Hackney Hammer Co., Cleveland.
Harness Specialties—
Buffalo Specialty Co., Buffalo, N. Y.
Insurance Companies—
Hartford Steam Boiler Co., Hartford, Ct.
Investments—
Muskegon Improvement Co., Muskegon.
Iron and Steel Roofing—
Sykes Iron & Steel Roofing Co., Niles, O.
Cambridge Iron Roofing Co., Cambridge, O.
Garry Iron Roofing Co., Cleveland.
Berger Mfg. Co., Canton, O.
Eberts Bros., Detroit, Mich.
Kanneberg Roofing Co., Canton, O.
The Long Steel & Iron Roofing & Corrugating Co., Indinapolis.
J. H. Eller & Co., Canton, O.
W. J. Burton & Co., Detroit, Mich.
Iron Ore, Bar and Pig Iron—
Oglebay, Norton & Co., Cleveland.
J. H. Outhwaite & Co., Cleveland.
Condit-Fuller Co., Cleveland, O.
E. C. Pope, Cleveland.
Cleveland Iron Mining Co., Cleveland.
Corrigan, Ives & Co., Cleveland.
Injectors—
Penberthy Injector Co., Detroit, Mich.
Garfield Injector Co., Wadsworth, O.
Lathes—
H. L Shepard, Cincinnati, O.
Parkin & Bosworth Co., Cleveland.
Lathe Dogs—
Palmer, Cunningham & Co., Philadelphia.
Mining Machinery—
Webster, Camp & Lane Machine Co., Akron, O.
Copeland & Bacon, New York.
Jas. H. Lancaster, New York.
Machine Shops—
Webster, Camp, & Lane Machine Co., Akron, O.
Toledo Machine & Tool Co., Toledo, O.
Spicer Mfg. Co., New Philadelphia, O.
Machinists' Tools and Supplies—
Parkin & Bosworth, Co., Cleveland.
Garvin Machine Co., New York.
Lodge & Davis Machine Tool Co., Cleveland.
Metal Ceilings—
Fred F. Bischoff, Chicago, Ill.
Merchandise Brokers—
L. H. Oldfield, Wichita, Kan.
Metallic Shingles—
W. J. Burton & Co., Detroit, Mich.
Metallic Roofing—
Stan Alumin Co., Canton, O.
Manufacturing Sites—
Muskegon Improvement Co., Muskegon.
Moulding Sand—
F. B. Stevens, Detroit, Mich.
Machinery—
Lodge & Davis Machine Tool Co., Cleveland.
Natural Gas Specialties—
A. Harvey's Sons Mfg. Co., Detroit, Mich.
Oil Burners—
Coates Oil Burner Co., Terre Haute, Ind.
Patents—
Munn & Co., New York.
W. T. Fitzgearld, Washington, D. C.
Pumps (Steam)—
E. H. Jones & Co., Cleveland.
Deming Co., Salem, O.
Southwark Foundry & Machine Co., Philadelphia, Pa.
Paint—
Iron Clad Paint Co., Cleveland.
Akron Chemical Co., Akron O.
Jos. Dixon Crucible Co., Jersey City.
Perforated Sheet Metal—
Harrington & King Perforating Co., Chicago Ill
Aitchison Perforated Metal Co., Chicago.
Pipe Cutting & Threading Machines—
Wells Machine Works, Fostoria, O.
Power Hammer—
Hackney Hammer Co., Cleveland.
Powder Mining Machinery—
Hercules Powder Co., Cleveland.
Portable Boilers—
Bassett, Presley & Train, Cleveland.
Railway Supplies—
Cleveland City Forge & Iron Co., Cleveland.
Rock Breakers and Ore Crushers—
Jas. H. Lancaster, New York.
Totten & Hogg, Pittsburgh, Pa.
Rubber Goods—
Fuller Bros., Cleveland.
Rolls and Pinions—
Totten & Hogg Iron & Steel Foundry Co., Pittsburgh, Pa.
Steam Boiler Inspectors—
Hartford Steam Boiler Inspection & Insurance Co., Hartford, Conn.
Saws—
Peter Gerlach & Co., Cleveland.
Steel Stamps and Stencils—
J. H. Fleharty & Co., Cleveland.
F. A. Sackman Cleveland, O.
Jas. Murdock Jr., Cincinnati, O
Sheet Iron—
Cleveland Rolling Mill Co., Cleveland.
Cambridge Iron & Steel Co., Cambridge, O.
Steel Rails, Blooms and Billets—
Cleveland Rolling Mill Co., Cleveland.
Sheet Steel—
Cambridge Iron & Steel Co., Cambridge O
Steel Laths—
Bostwick Steel Lath Co., Niles, O.
Steel Castings—
Chester Steel Casting Co., Philadelphia, Pa
Steam Traps—
Spaulding & Metcalf, Chicago, Ill.
Steam, Gas and Plumbers Supplies—
A. Harvey's Sons Mfg. Co., Detroit Mich.
Smoke Consumers—
C. O. Arey, Cleveland.
Twist Drills—
Cleveland Twist Drill Co., Cleveland.
Graham Twist Drill Co., Detroit, Mich.
Turnbuckles—
Cleveland City Forge & Iron Co., Cleveland.
Time Registers—
The Automatic Time Stamp and Register Boston, Mass.
Ventilating Fans—
LaFountaine Mfg Co., Cleveland, O.
E. H. Jones & Co., Cleveland.
Water Gas Furnaces—
W. S. Hutchinson, Chicago, Ill.
Window Blinds—
Hartman Sliding Blind Co., Wooster, O.
Wood-Working Machinery—
Indiana Machine Work. Ft. Wayne, Ind.
Frank & Co., Buffalo, N.Y.
The Egan Co., Cincinnati, O.
Wire Machinery—
John Adt & Son, New Haven, Conn.
Washers—
Milton Mfg. Co., Milton, Pa.

BOSTWICK PATENT.

A great saving in mortar, material and labor Write for Catalogue and Sample.
THE BOSTWICK STEEL LATH CO.,
38 Park Row, New York City. Niles, O
Mention this Paper.

J. M. ALLEN, President.
WM. B. FRANKLIN, Vice-President.
F. B. ALLEN, Second Vice-President.
B. PIERCE, Secretary and Treasurer.

HARTFORD STEAM BOILER INSPECTION AND INSURANCE CO. HARTFORD, CONN.

A S. FERRY, Gen'l Agt., 208 Superior Street, Cleveland, O.
C. A. BURWELL, Chief Inspector, 208 Superior St., Cleveland, O.
R. D. BRIGGS, Special Agt., 208 Superior St., Cleveland, O.
J. E. WOLCOTT Special Agent, 208 Superior St., Cleveland, O.
L. C. BURWELL, Special Agent, 81 4th Ave Pittsburgh, Pa.

FOR
ARTISTIC
PRINTING
WRITE
CLEVELAND
PRINTING &
PUBLISHING CO.,
CLEVELAND O.

CLEVELAND BUSINESS DIRECTORY.

F. FELKEL,
CIVIL ENGINEER AND ARCHITECT,
155 ST. CLAIR ST., CLEVELAND, O.
IRON BUILDINGS, LARGE SPAN ROOFS
PLANS for Manufacturing Plants, Warehouses andother Heavy Structures a SPECIALTY.

Bolt and Nut Works.
THE UPSON NUT CO, Manufacturers of Nuts, Washers, Carriage, Machine, Plow and Elevator Bolts, Coach Screws, etc.

Hardware and Iron.
CLEVELAND ROLLING MILL CO., manufacturers of Steel and Iron Wire and Steel Tire.

Machinists' Supplies.
PARKIN & BOSWORTH, 9 and 11 So. Water St., dealers in Manufacturers' Supplies, Machinery and Tools.

Steel Stamps and Stencils.
FLEHARTY, J. H. & CO., Rubber Stamps, Seals, Stencils, Automatic Check Punches and Numbering Machines. 92 Seneca St.

BUSINESS DIRECTORY.

Akron, O.
WEBSTER, CAMP & LANE MACHINE CO., Founders and Machinists, 12 Main st.

CHEMIST—A chemist wants position in iron or steel works, or at ore mines. Address L. P. N., Iron Trade Review.

SHEPARD'S NEW $60
SCREW CUTTING
Foot Lathe

Foot & Power Lathes, Drill Presses, Scroll Saw Attachm'ts, Mandrels, Chucks, Twist Drills, Dogs, Calipers, etc. Lathes on trial. Lathes on payment. Send for catalogue of Outfits for Amateurs or Artisans. Address H L. SHEPARD, Agt., 124 East Second St., Cincinnati, O.

Bischoff Metal Ceilings,
(PATENTED.)

It will pay to investigate and write for catalogue.
Estimates submitted on application.
Fred. F. Bischoff & Co.
24 W. Lake St,
CHICAGO. - ILL.

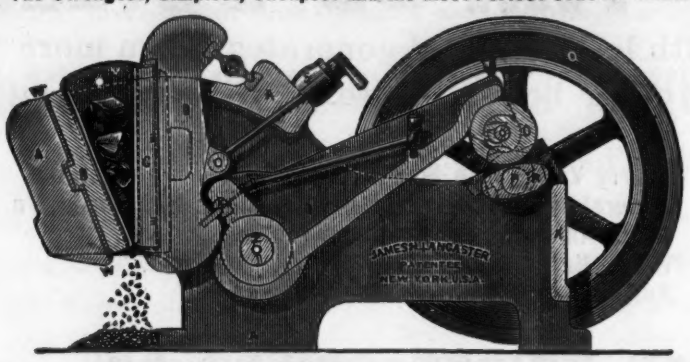
JAS. MURDOCK, JR.
Manufacturer of
STEEL STAMPS
NAME PLATES,
TIME & TOOL ROOM CHECKS.
NILES TOOL WORKS 25
52 Longworth St, Cincinnati, O

L. H. OLDFIELD.
Merchandise Broker.
Correspondence Solicited.
WICHITA, KANSAS.

Tens of thousands of these blinds are in use. Agents wanted; Send 4-cent stamp for an 80-page illustrated catalogue to
HARTMAN SLIDING BLIND CO.,
59 Beaver St., WOOSTER O., U. S. A

The "Lancaster" Rock Breaker and Ore Crusher

The Strongest, Simplest, Cheapest and the Most Perfect Crusher Made.



Instantly adjustable to yield any desired uniform grades of product.

Half the power only required and is less liable to breakage, and less in first cost and also in subsequent wear and tear, and less weight than any rival's breaker. For crushing rock for macadamizing and concreting purposes, and also for reducing ores, these breakers are specially efficient.

The "Lancaster" Crushers are also made in "Sections" for easy transportation in mountainous regions. May be mounted on wheels, worked by hand, horse gear and steam or other power, and also fitted with Rotary Screens, Elevators and Conveyors. Correspondence and trial tests solicited.

THE "LANCASTER"

Will automatically dig, raise and discharge mud, clay, gravel, sand, hard pan ores, rock phosphates and fire-clay from their beds and banks, and also load and unload vessels or barges with sand, coal, ores, grain and other materials. These Grapples are made of best forged steel, with four penetrating scoops, operated solely by compound leverage, thus dispensing with the inside sheaves, drums, catches, gears, chains and friction, found in all rival buckets. They may be worked by the "Lancaster" hand or horse-power, hoisters, or by any maker's double drum hoisting engines.

Send for our new illustrated price list, agency terms and testimonials, and make appointment to see our Rock Breakers, Grapples, Hand, Horse and Steam Power Hoisters at work. Comparison of our prices, capacities and merits with all rival Grapples, Rock Breakers, Hoisters, etc., earnestly solicited.

Self-Penetrating Grapple, Excavator and Dredger.

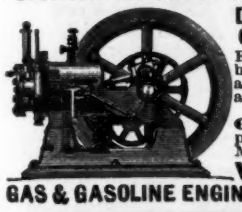
Correspondence solicited. Manufactured and sold by the patentee.

THE LANCASTER DIRECT STEEL PROCESS.

JAMES H. LANCASTER. (P. O. BOX 3139) 202 BROADWAY. NEW YORK, U. S. A.

GAS and GASOLINE ENGINES

STATIONARY and PORTABLE. All Sizes.



Dwarfs in Size, but Giants in Strength.

Expense one cent an hour per horse power and requires but little attention to run them.

Every Engine Guaranteed. Full particulars free by mail Mention this paper.

VAN DUZEN GAS & GASOLINE ENGINE CO. Cincinnati, O.

Just Drive 'Em In and CLINCH 'Em.

THEY'LL DO THE REST.

Rapid HARNESS MENDERS.

WILL MEND

Any Harness, Halter or Strap in less time, and do the work better than any Harness maker can, AND

COSTS ONLY HALF A CENT

Sold by Grocers and Hardware Dealers. Cost only 25c per box of one gross (three sizes.)

NO TOOLS REQUIRED

BUFFALO SPECIALTY MFG. CO., BUFFALO, N. Y.

Elastic Rotary-Blow Riveting Machine.

JOHN ADT & SON,

NEW HAVEN, CONN.

Builders of Machinery for Hardware Manufacture.

AUTOMATIC

Wire Straightening and Cutting Machines,

BUTT MILLING MACHINERY,

Butt Drilling Machinery,

Riveting Machines.

Foot Presses,

Sprue Cutters, Etc.

Wheeling & Lake Erie Railway.

THE NEW THROUGH LINE

BETWEEN

TOLEDO

—AND—

Steubenville, Pittsburgh, Marietta.

THROUGH COACHES

BETWEEN

Toledo & Marietta.

Through Sleepers Between

PITTSBURGH AND CHICAGO.

AND DAY COACHES BETWEEN

Toledo and Pittsburgh, Via Akron, Cuyhoga Falls, Kent, Ravenna, Leavittsburg, Warren, Niles, Girard, Youngstown, New Castle and Allegheny.

The Only Line running through

"BEAUTIFUL ZOAR."

A. G. BLAIR, Traffic Manager. JAS. M. HALL, Gen'l Pass. Agent.

TRAVELERS' REGISTER.

Standard Time.

Erie Railway.

Depot, South Water Street and Viaduct.

	Arrive.	Depart.
N. Y. & Pitts. Express.....	‡5 58 a m	*8 25 a m
Fast N. Y. & Pitts. Express	*10 55 a m	*3 00 p m
Mahoning Accommo.....		†6 40 a m
Pittsburgh Express.....	†6 25 p m	
Youngstown Local.....	†8 05 a m	
Mahon'g div. & Pitts Local		*11 40 a m
Mahoning Val. Accom.....		†4 30 p m
Pittsburgh Express.....	†1 20 p m	11 10 p m
New York Express.....	*8 00 p m	.....

*Daily. †Daily, except Sunday. ‡Daily except Monday.

Cleveland & Canton Railroad.

(Standard Gauge.)

Depart for—

Zanesville and Coshocton—6:50 a. m., 3:00 p. m.
Canton—6:50 a. m., 3:00 p. m., 6:20 p. m.
Kent—6:50 a. m., 3:00 p. m., *5:45 p. m. 6:20 p. m.
Bedford—6:50 a. m., 11:10 a. m., 1:30 p. m., 3:00 p. m., 4:40 p. m., *5:45 p. m., 6:20 p. m. 10:35 p. m.
Newburgh—6:15 a. m., 6:50 a. m., 11:10 a. m., 1.30 p. m., 3:00 p. m., 4:40 p. m., *5:45 p. m., 6:20 p. m., 10:35 p. m.

Arrive from—

Zanesville and Coshocton—10:30 a. m.,6:30 p m.
Canton, 10:30 a. m., 2:35 p. m., 6:30 p. m.
Kent—*8:10 a. m., 10:30 a. m., 2:35 p. m., 6:30 p.m.
Bedford—6:00 a. m., *8:10 a.m., 10:30 a.m., 1:05 p. m., 2:35 p. m., 4:15 p. m., 6:30 p.m., 7:10 p.m.
Newburgh—6:00 a. m., 7:15 a. m., *8:10 a. m., 10:30 a. m., 1.05 p. m., 2:35 p. m., 4:15 p. m., 6:30 p. m., 7:10 p. m.

Trains marked * run daily.

Valley Railway.

FOR AKRON, CANTON AND MARIETTA.

Depot oot South Water Street.

	Depart.	Arrive.
Valley Junction Mail.....	*7 25 a m	*6 40 p m
Chicago Express	*8 35 a m	*10 00 p m
Marietta Express.....	†11 15 a m	†2 35 p m
Balto. & Wash. Express....	*4 00 p m	*10 25 a m
Cleve. and Canton Express	†6 30 p m	†8 20 a m

*Daily. †Daily, except Sunday.

J. T. JOHNSON, Gen. Supt. J. B. CAVEN, Gen. Pass. Agt.

From Cleveland Union Station.

PENNSYLVANIA LINES.

Cleveland & Pittsburgh R. R.

	Arrive.	Depart.
For Pittsburgh, Baltimore, Washington, Philadelphia and New York.	d5 25 a m d11 40 a m 6 35 p m	7 45 a m d1 40 p m d11 10 p m
Wellsville, Wheeling and Bellaire.	12 30 p m 6 35 p m	7 45 a m 1 05 p m *11 10 p m
Alliance Accom.....	10 10 a m	3 25 p m
Ravenna Accom.....	8 25 a m	5 00 p m

d Daily. * Except Saturday. Other trains except Sunday. Through Pullman Sleepers to New York on 1:40 p. m. train daily.

From Cleveland Union Station.

Mt Vernon and Pan Handle Route

Cleveland & Pittsburgh R. R.

	Arrive.	Depart.
For Cuyahoga Falls, Akron, Orrville, Millersburg, Gambier, Mt. Vernon, Columbus, Xenia, Dayton, Cincinnati, Louisville, Indianapolis, St. Louis, and all points in the South and Southwest.	d 7 00 a m 5 40 p m	8 00 a m d 8 00 p m
For Cuyahoga Falls, Akron, Orrville, Millersburg, Gambier, Mt. Vernon and Columbus.	12 30 p m	1 05 p m
For Cuyahoga Falls, Akron, Orrville, Chicago, and all points in the West and Northwest.	5 40 p m 10 10 a m	8 00 a m 3 25 p m

d Daily. Other trains except Sunday.

Pullman Palace Sleeping Cars daily between Cleveland, Columbus and Cincinnati. City ticket office, Weddell House corner.

FT. WAYNE, CINCINNATI & LOUISVILLE RAILROAD.

The Popular Route Between the

NORTH and SOUTH

The Direct Route to or from

Fort Wayne, Indianapolis, Terre Haute, Evansville and St. Louis.

13 MILES SHORTER BETWEEN 13

Fort Wayne and Indianapolis,

Than any other Route.

22 MILES SHORTER AND QUICKER 22

BY THREE HOURS, BETWEEN

Louisville and Fort Wayne.

ASK FOR TICKETS VIA

Ft. Wayne, Cincinnati & Louisville R. R.

For sale by all Agents of connecting lines, East, West, North and South.

GEO. W. SAUL, Gen'l Supt. W. H. FISHER, Gen'l Pass. & Tk. Agt.

FORT WAYNE, IND.

PITTSBURGH AND LAKE ERIE RAILROAD.

"Cleveland & Pittsburgh Short Line."

Twenty (20) Miles Shorter than any other route between Cleveland, Pittsburgh, Washington, Baltimore and the South East.

5 Through Trains Daily 5

FAST TIME. NO DELAYS.

"For scenery picturesque and varied,
Through valleys green, 'mong mountains ser-
The people's favorite route I ween, [ried,
The P. & L. E. sits enthroned as queen."

See that your tickets read via

THE PEOPLE'S FAVORITE ROUTE.

R. HOLBROOK, Gen'l Supt., A. H. CLARK, G. P. & T. A. Pittsburgh, Pa.

SCIOTO VALLEY RAILWAY.

Direct route, Columbus, O., to Circleville, Chillicothe, Waverly, Portsmouth, Ironton and Ashland, Ky. Three trains daily except Sunday. Favorite route, North and West, making close connection at Ashland, Ky., with the Chesapeake & Ohio Ry., through the canons of New River, passing White Sulphur Springs and the many Summer resorts of the Alleghenies in Virginia.

Shortest and Quickest Route to Richmond, Lynchburg, Newport News, Old Point Comfort.

J. ROBINSON, Receiver, Columbus, O. JNO. J. ARCHER, Gen'l Pass. Agt

---

—THE—

Cleveland & Marietta Ry.

THROUGH TRAINS

BETWEEN

Toledo, Cleveland and the Ohio River.

The shortest and best Route via Marietta to

Washington, D. C., Charleston, W. Va., Parkersburg, W. Va., and the South.

Direct connections at Union Depots, with all great through lines to all Points

WEST, NORTHWEST, SOUTH, SOUTHWEST AND SOUTHEAST.

Lowest Rates. Quickest Time. Best Accommodations.

Tickets sold and baggage checked through to destination. Reliable information and best rates will be furnished by any agent of the Popular C. M.

A. T. WIKOFF, Pres. and Gen. Mgr. W. K. RICHARDS, G. P. & T. A.

ERIE RAILWAY

THE FAVORITE

—AND—

PICTURESQUE ROUTE

—TO—

New York, Boston and the East.

The shortest and quickest Route to Pittsburgh, Washington and Baltimore & the Southeast.

New Central Depot So. Water St. and Viaduct

	Depart.
No. 62, Accommodation.....	† 6 00 a m
No. 72, New York & Pitts. Express....	* 8 10 a m
No. 70, Pittsburgh Accom.....	*11 25 a m
No. 64, New York & Pitts. Limited...	* 2 50 p m
No. 66, Mantua Accommo.....	* 4 20 p m
No. 74, Youngst'n Ex.....	† 6 00 p m
No. 68, New York & Pitts. Ex.....	*11 00 p m
	Arrive.
No. 61, N. Y. & Pittsburgh Express...	† 5 15 a m
No. 71, Youngstown Accom.....	* 7 15 a m
No. 65, New York & Pitts. Lim.....	* 9 55 a m
No. 67, Pittsburgh Accom.....	*12 30 p m
No. 73, Leavittsburgh Local.....	* 2 10 p m
No. 63, New York & Pitts. Ex.....	* 6 50 p m
No, 75, Mantua Accom.....	* 7 20 p m
No. 69, Youngstown Express.....	† 9 10 p m

*Daily. †Daily, except Sunday.

Baggage checked through to all points East.

Through tickets and information regarding the route can be obtained at office, 141 Superior street, and at Depot N. Y., P. & O. Railroad, South Water street and Viaduct, Cleveland.

A. M. TUCKER, Gen. Mang., Cleveland, O.
W. C RINEARSON, Gen. Pass. Ag't, New York
G. K. FOUTS, C P. & T. A., Cleveland.

ECLIPSE ELECTROTYPE AND ENGRAVING CO.

AUST & CLARK PROPRIETORS

LITHOGRAPH BUILDING CLEVELAND

THE HAZELTON TRIPOD BOILER

Furnishes more and dryer steam with less fuel, and generates steam more rapidly, than any other boiler in use.

CLEVELAND REFERENCES.

J. W. Britton, Esq.,
Woods, Jenks & Co.,
W. S. Tyler Wire Works Co.,
Cleveland Forge & Iron Co.,
Bishop & Babcock Co.,
Cleveland Saw Mill & Lumber Co.

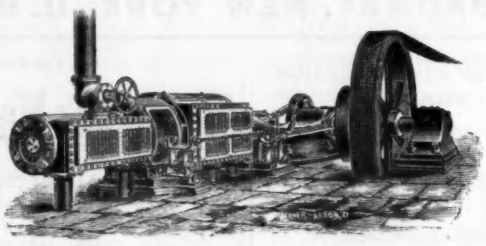
Cherry Valley Iron Works, Leetonia, O.,
Federal St. & Pleasant Valley Pass. Ry., Pittsburgh, Pa.,
Anglo-American Provision Co., Chicago,
Wellsville Plate & Sheet Iron Co., Wellsville, O.,
Falcon Iron & Nail Co., Niles, O.

Address: THE HAZELTON TRIPOD BOILER CO.,

GEO. A. HUMPHREYS, Ag't, 723 Perry-Payne Bldg., CLEVELAND, O. 809 Monon Block, 324 Dearborn St., CHICAGO, ILL.

Who also offer the Hazelton Purifier which we guarantee will remove 90 to 95 per cent. of the impurities from feed-water.

WILLIAM TOD & CO., YOUNGSTOWN, OHIO.



The Porter Hamilton Engine.

Single Compound and Condensing-100 horse-power and upwards.

THE HAMILTON BLOWING EFGINE, HYDRAULIC CRANES, ACCCUMULATORS AND SHEARS.

HEAVY SPECIAL MACHINERY GENERALLY.

☞ SEND FOR ILLUSTRATED CATALOGUE.

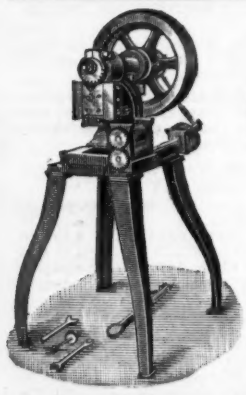
E. H. JONES & CO.,

ENGINEERS AND CONTRACTORS,

223-225 River St., CLEVELAND, O.

Steam Plants Complete. Engines, Boilers, Pumps, Heaters, Etc.
Steam and Hot Water Heating.

STURTEVANT'S BLOWERS, COILS, ETC.,
FOR HOT BLAST HEATING.



THE TOLEDO MACHINE TOOL CO.,

MANUFACTURERS OF

PRESSES, DROP PRESSES, DIES,

AND

Special Machinery

DESIGNED AND BUILT TO ORDER.

Dies for all kinds of sheet metal goods, leather, paper, etc. Inventors' models and specialties. Send for circulars and prices.

St. Clair and Washington Streets.

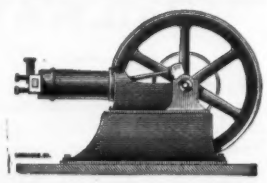
Mention this paper. TOLEDO, O

Otto Gas Engine Works,

SCHLEICHER, SCHUMM & CO., { Philadelphia. Chicago.

Horizontal OTTO Gas Engines.
Vertical OTTO Gas Engines.
Twin Cylinder OTTO Gas Engines.
Combined OTTO Gas Engine Pumps.
Combined OTTO Gas Engine Dynamos.

SIZES: 1, 2, 4, 7, 10, 15, 25 AND 50 HORSE-POWER.



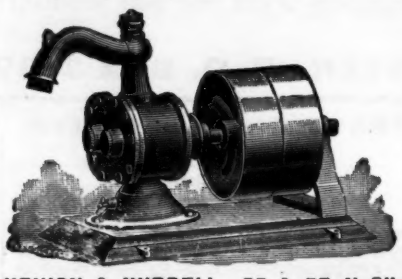
LaFountaine Manufacturing Co.,

MANUFACTURER OF

VENTILATING FANS AND BLOWERS, HANGERS,

Carpet Cleaning and Laundry Machinery and other Special Machinery.

1335 Lexington Ave., - CLEVELAND, O.



THE DEMING CO.,

SALEM, OHIO.

Pumps,

For HAND AND POWER.

Adapted for BOILER FEEDING, FIRE PURPOSES, etc.; also ARTESIAN WELL CYLINDERS and WORKING HEADS for FACTORIES, MILLS and FURNACES.

HENION & HUBBELL, 55 & 57 N. Clinton St., Chicago, General Western Agents

Send for illustrated catalogue and price list. Mention this paper.

BOILERS

MAHONING BOILER WORKS.

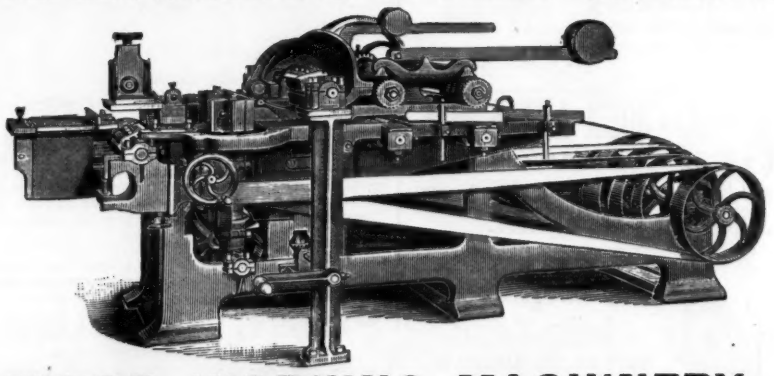
PIPES, STACKS, BEAMS, ROOF TRUSSES, BLAST FURNACES & ROLLING MILL WORK.

WM. B. POLLOCK & CO. YOUNGSTOWN, O.

FRANK & CO., BUFFALO, N. Y.

MANUFACTURERS OF

PLANERS, BAND SAWS, MOULDERS, SCROLL SAWS, TENONERS, SAW TABLES, MORTISERS BENCHES.



WOOD WORKING MACHINERY.

HERCULES POWDER

HERCULES,
THE GREAT STUMP AND ROCK
ANNIHILATOR.

SEND FOR DESCRIPTIVE PAMPHLET.

Stump before a blast. | Fragments after a blast.

STRONGEST and SAFEST EXPLOSIVE

Known to the Arts.

POWDER, FUSE, CAPS,

Electric Mining Goods,

AND ALL TOOLS FOR STUMP BLASTING.
FOR SALE BY THE
HERCULES POWDER COMPANY,
40 Prospect Street, Cleveland, Ohio.
J. W. WILLARD, Manager.

THE BALL & WOOD CO.,

Owners of Ball Patents and Builders of

Improved Automatic Cut-off Engines.

Under the personal supervision of the inventor, F. H. Ball.

Simple Engines, **Electric Lighting Plants,**
Compound Engines, for **Electric Railway Plants,**
Triple Expansion Engines, **Manufacturing Engines,**

And all purposes requiring close regulation and economy.

WORKS, ELIZABETH, N. J. OFFICE, 15 CORTLANDT ST., N. Y.

IRON CLAD PAINT CO.

Factory, 75 & 77 Central Way. Sec. & Treas., No. 3 Case Build'g.
CLEVELAND, OHIO.

Trade Mark Patented.

ORDER DIRECT FROM THE
Iron Clad Paint Co.

And get the genuine article, and save liability of suit for using an article made in violation of the patents issued to Wm. Green, and now owned by this Company.

IRON CLAD PAINT is the most durable, most fire-proof and cheapest Paint made.

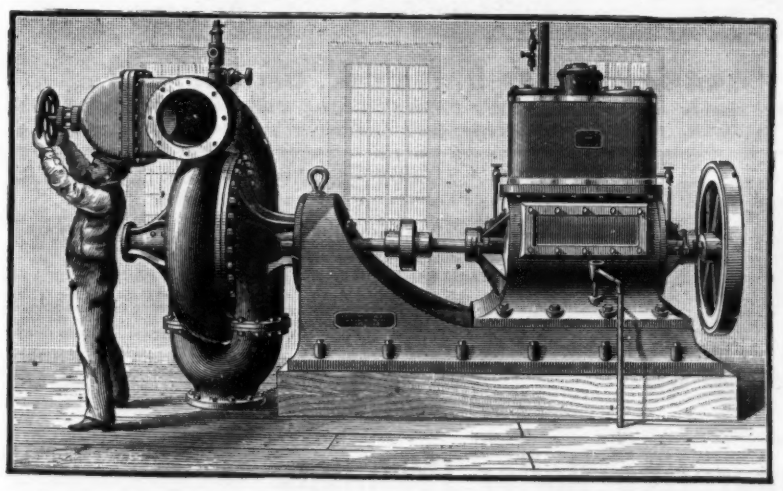
FURNISHED both Dry and Ground in Oil.

USED BY NEARLY ALL THE RAILROADS

WESTINGHOUSE ENGINES

A SAMPLE INSTALLATION.

Standard Automatic Engine coupled direct to a Centrifugal Pump.
Speed 280 Revolutions.



Over 4000 Westinghouse Standard Engines in use.

THE WESTINGHOUSE MACHINE COMPANY.
PITTSBURGH. PENNA. U.S. OF A.

SKINNER ENGINE CO., ERIE, PA.

OVER 4500 IN USE.

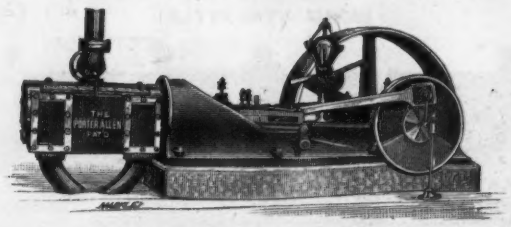
MANUFACTURERS OF

AUTOMATIC, STATIONARY & PORTABLE

ENGINES and BOILERS

SEND FOR CATALOGUE.

SOUTHWARK FOUNDRY & MACHINE CO., Philadelphia, Pa.



SOLE MAKERS OF THE

PORTER-ALLEN AUTOMATIC ENGINE.

ALSO BUILDERS OF

Blowing Engines, Reversing Engines, Hydraulic Cranes,
Centrifugal Pumps, Accumulators, Boilers Tanks, etc.

GARRY IRON & STEEL ROOFING COMPANY

CORRUGATED
ROOFING SIDING & CEILING
CLEVELAND OHIO.

THE KANNEBERG ROOFING CO., Canton, O.

The Originators of Strictly Genuine Steel Roofing.)

MANUFACTURERS OF THE

Kanneberg Pat., Latest Improved, Folded Lock Seam Roofing,

Made of STRICTLY GENUINE STEEL.

CORRUGATED IRON (four sizes of corrugations), and Crimped Edge Iron Roofing and Siding, Beaded Iron Siding and Ceiling, Water Proof Building Paper, Dry and Ready Mixed Paints, Etc

Write for Catalogues, Price Lists and Samples.

CLEVELAND
GALVANIZING
WORKS.
H. H. HODELL & CO.,

Galvanizing in all its branches, and Manufacturers of Rubber Buckets for chain pumps.
CLEVELAND, OHIO.

FOR SALE---BLOWING ENGINE.

Vertical pattern, with balanced steam slide valve gear, steam cylinder 14-in. diameter, air cylinder 40-in. diameter, stroke 24 in., 1 to 190 strokes per minute; engine new. For price and particulars address THE JAMES LEFFEL & CO., Springfield, O.

CAMBRIDGE ROOFING CO., Cambridge, O. & Chatanooga, Tenn.

Manufacturers of

Plain, Rolled, Crimped Edge, Corrugated and Beaded Roofing, Siding and Ceiling.

PURE STEEL A SPECIALTY

Send for Descriptive Catalogue.

J. H. ELLER & CO.,

—MANUFACTURERS OF—

Steel Roofing,

Corrugated Iron,

Crimped Edge Roofing and Siding, Beaded Siding and Ceiling, Patent Slip Joint EAVE TROUGHS, etc.

WRITE US FOR PRICES.

Agents Wanted. Address OFFICE NO. 223, CANTON, O

CRIMPED

SYKES'
IMPROVED
Best Roof in the World. Suitable for all classes of buildings. Easy put on.

All my Iron and Steel is re-rolled and box annealed, well painted on both sides with the Best of Paint and Pure Linseed Oil.

CORRUGATED

SYKES IRON & STEEL ROOFING CO.,
Send for Circular and Price List and mention this paper
NILES, O., and CHICAGO, ILL.

STEEL CASTINGS

FROM 1-4 TO 15,000 LBS. WEIGHT.

True to pattern, sound, solid, free from blow-holes and of unequaled strength.

Stronger and more durable than iron forgings in any position, or for any service whatever.

60,000 CRANK SHAFTS and 50,000 GEAR WHEELS of this steel now running prove this.

Crossheads, Rockers, Piston-Heads, etc., for Locomotives. STEEL CASTINGS of every description.

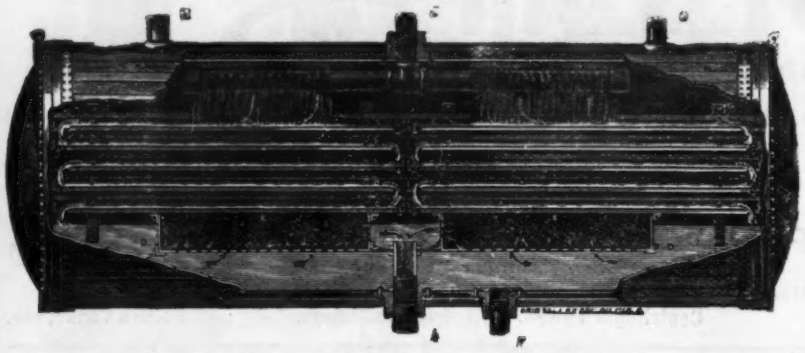
Send for circulars and prices to

Chester Steel Castings Co.,

WORKS: CHESTER, PA. OFFICE 407 LIBRARY ST., PHIADELPHIA, PA.

STILWELL'S PATENT LIVE STEAM-FEED WATER PURIFIER.

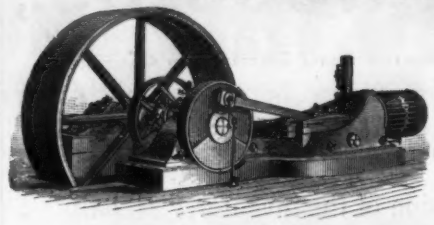
(HORIZONTAL STYLE.)



Removes all Impurities. Entirely Prevents Scale in SteamBoilers.
CATALOGUE ON PPLICATION.

STILWELL & BIERCE MANUFACTURING CO.
DAYTON, OHIO.

THE BUCKEYE AUTOMATIC CUT-OFF ENGINES.



Slow Speed, Medium Speed, and High Speed Engines.

Simple, Compound, and Triple Expansion Engines, High Pressure Boilers.

Complete Steam Power Plants of Highest Attainable Efficiency.

Address BUCKEYE ENGINE CO., SALEM, O.

SALES AGENTS:
Buckeye Engine Co., Sales Agency, 10 Telephone Building, New York.
A. A. Hunting, John Hancock Building, Boston, Mass. Robinson & Cary Co., St. Paul, Minn.
N. W. Robinson, 97 Washington St., Chicago, Ill.

Water Gas Furnaces

FOR LOCOMOTIVES, STEAMBOATS AND STATIONARY BOILERS.
A Perfect Smoke Burner.
W. S. HUTCHINSON. 6 Washington-st., Chicago.

OLD 1874. **CLEVELAND TWIST DRILL CO.,** RELIABLE 1891.

SEND FOR CATALOGUE. **Cor. Lake & Kirtland Sts., Cleveland, O.** WRITE FOR DISCOUNTS.

The Hart or Detroit

Emery Corundum Wheels and Machinery.

Write to J. WENDELL COLE, M. E.,
District Manager, Box 153, Chicago, Ill., or Box 84, Columbus, O.

N. B.—Also Agent for WM. SELLERS & CO.'S SPECIAL TOOL GRINDER and TWIST DRILL GRINDER WITH POINTER, for Pennsylvania, Ohio, Indiana, Illinois and Wisconsin.

Awarded the GRAND PRIZE at the Paris Exhibition.

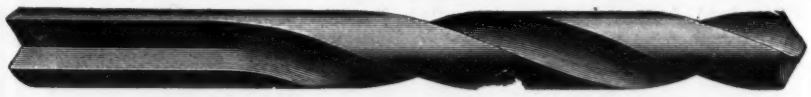
SEND FOR THIS BOOK
FREE ON APPLICATION.
THE BABCOCK & WILCOX CO.
WATER TUBE
STEAM BOILERS
30 CORTLANDT ST. N.Y.
21 BOTHWELL ST. GLASGOW, SCOTLAND.
BRANCH OFFICES
MANUFACTORIES IN UNITED STATES, SCOTLAND, FRANCE, GERMANY & AUSTRIA.

Cleveland Office, 412, Perry-Payne Building, Cleveland, O.

PENBERTHY AUTOMATIC INJECTOR.

Guaranteed 99 per cent. Efficiency
AS A BOILER FEEDER
42,000 in actual use.
Sent on 30 days' trial.

PENBERTHY INJECTOR COMPANY.,
Manufacturers,
DETROIT, - MICH.
C. H. PRESLEY, Agent, Cleveland, O.

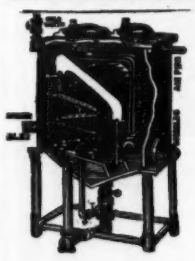


GRAHAM TWIST DRILL CO., Detroit, Mich.,
Sole manufacturers of GRAHAM'S PATENT GROOVED SHANK TWIST DRILLS and CHUCKS. Endorsed by progressive mechanics everywhere. Send for Catalogue.

BELTING.

For general work use only Shultz Fulled Belting, but for a main driving belt take Shultz Leather Link Belt. It will give you more power and last longer than any other belt now made. We will put one in for you under full guarantee and on 60 days' trial. For sale by

THE PARKIN & BOSWORTH CO., 8 S. Water St., CLEVELAND, O.



WEBSTER'S "VACUUM" EXHAUST STEAM ECONOMIZER,
Feed-Water Heater and Purifier

Is the most perfect device known for HEATING and PURIFYING the FEED-WATER for steam boilers, preventing scale, and for HEATING BUILDINGS of any description, WITHOUT BACK PRESSURE on engines, returning CONDENSATION to the BOILER IN THE ONE APPARATUS. Readily cleaned without stopping machinery. All parts accessible.

FURNISHED ON TRIAL FOR ACCEPTANCE.

Before you decide upon the adoption of any Feed-Water Heater and Purifier, or any device for assisting the circulation of steam for heating purposes, (after receiving full information of every device in the market) we would be pleased to call upon you personally (at our expense) and explain, with convincing proofs, the superiority of Webster's "Vacuum" Exhaust Steam Economizer over all pressure, coil, tubular or open heaters. Send for New Catalogue.

WARREN WEBSTER & CO., Prop'rs, 491 N. Third St., Phila.
74 Cortlandt St., New York. 159 La Salle St. Chicago, Ill.
94 Pearl St., Boston, Mass.

PRESSED WROUGHT IRON OPEN TURN BUCKLES.

BEST AND Cheapest.

The list retail price of this Buckle is less than one-half the wholesale price of inferior goods when we commenced to manufacture, and dealers, even in small towns, find it profitable to carry a stock to sell with iron for tie rods

CLEVELAND CITY FORGE & IRON CO., CLEVELAND, OHIO.

Enterprise Boiler Company, YOUNGSTOWN, OHIO.

MANUFACTURERS OF

BOILERS, AND TANKS, SHEET IRON AND PLATE WORK

Of all Descriptions.

REYNOLDS BROS.,
MANUFACTURERS OF
Hand Cut Files
AND RASPS.
We solicit the commercial trade only.
133 & 135 N. Water St.,
COLUMBUS, OHIO.

Old Files Recut and Warranted Superior to any Machine Cut and Lead Tempered in the market. Send for price list.

INDUSTRY FILE WORKS,
A. & H. Gough, Props.,
Manufacturers of
Files and Rasps,
Equal to the Best English File.
OLD FILES RE-CUT.
All Kinds of Job Grinding.
OFFICE & WORKS,
48 COLUMBUS ST.,
CLEVELAND, O
C. GOUGH Manager.
Mention this paper.

Jobbers of all kinds of **Roofing Materials.**

W. H. EBERTS. ESTABLISHED 1871 J. M. EBERTS

EBERTS BROS,
MANUFACTURERS OF
CORRUGATED IRON ROOFING, SIDING & CEILING.
OFFICE AND WORKS 192 TO 198 HIGH ST. WEST
DETROIT, MICH.

PRESSED STANDING SEAM, V Crimped and Roll Cap **IRON ROOFING.**